HNOLOGY DEPT.

Gas Journal

Vol. 272. 104th Year. LONDON, OCTOBER 8, 1952. No. 4662. Price 1/3

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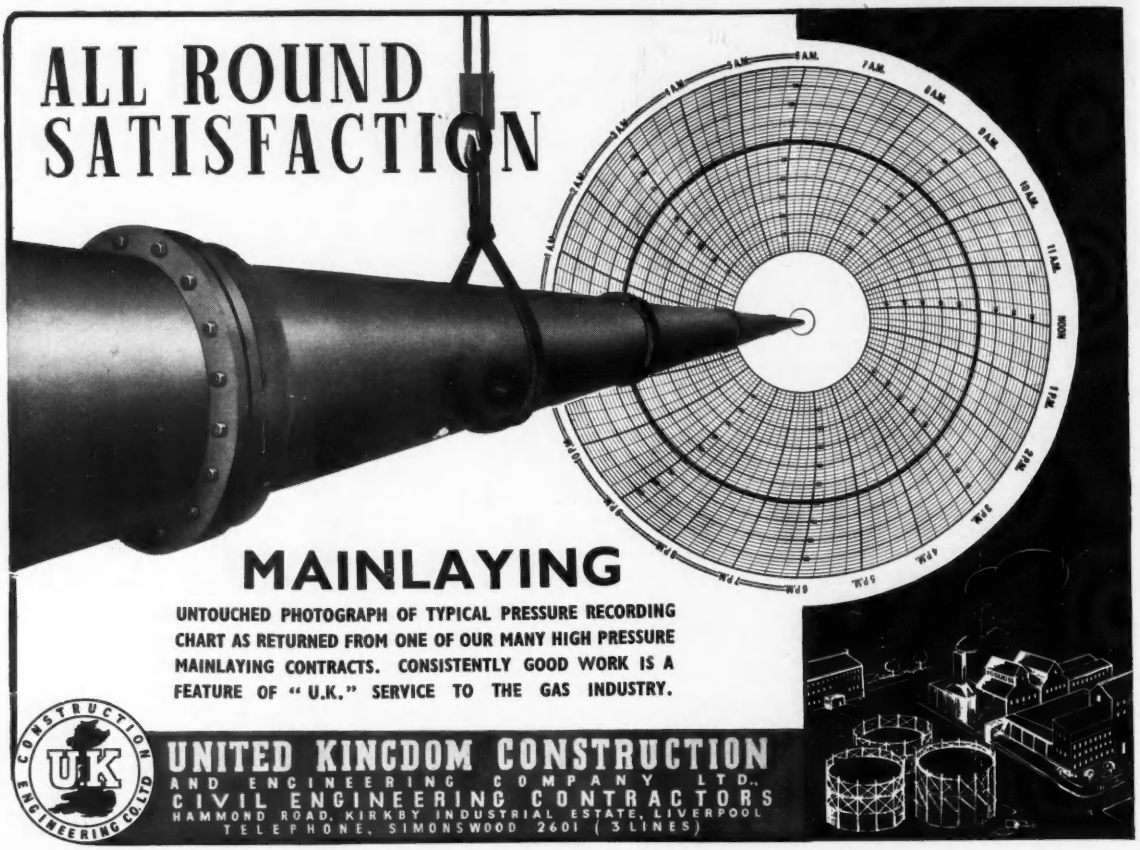

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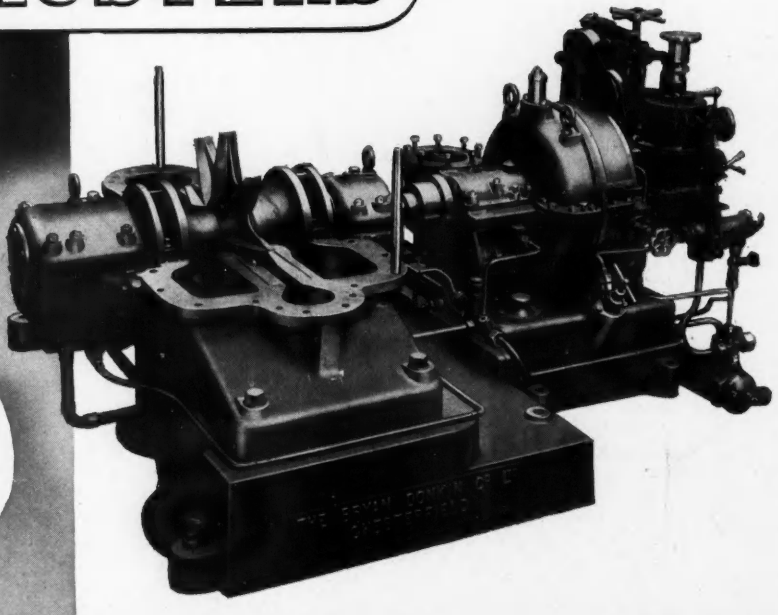

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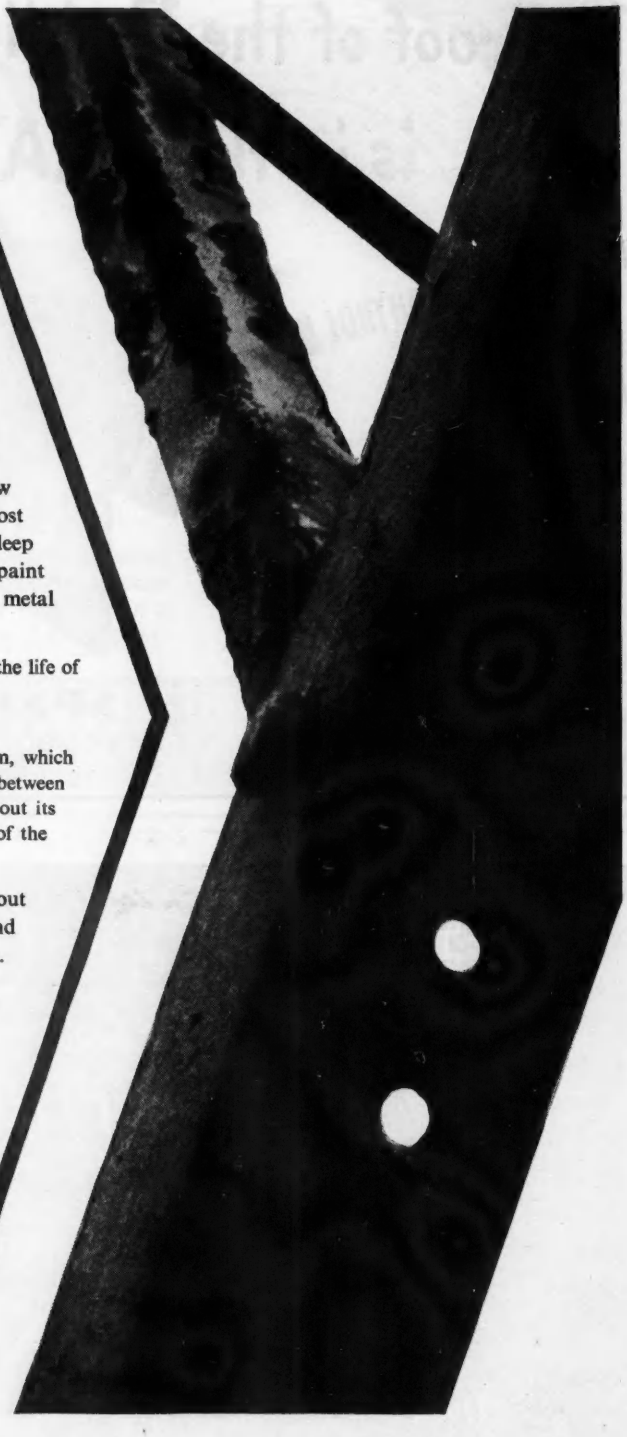

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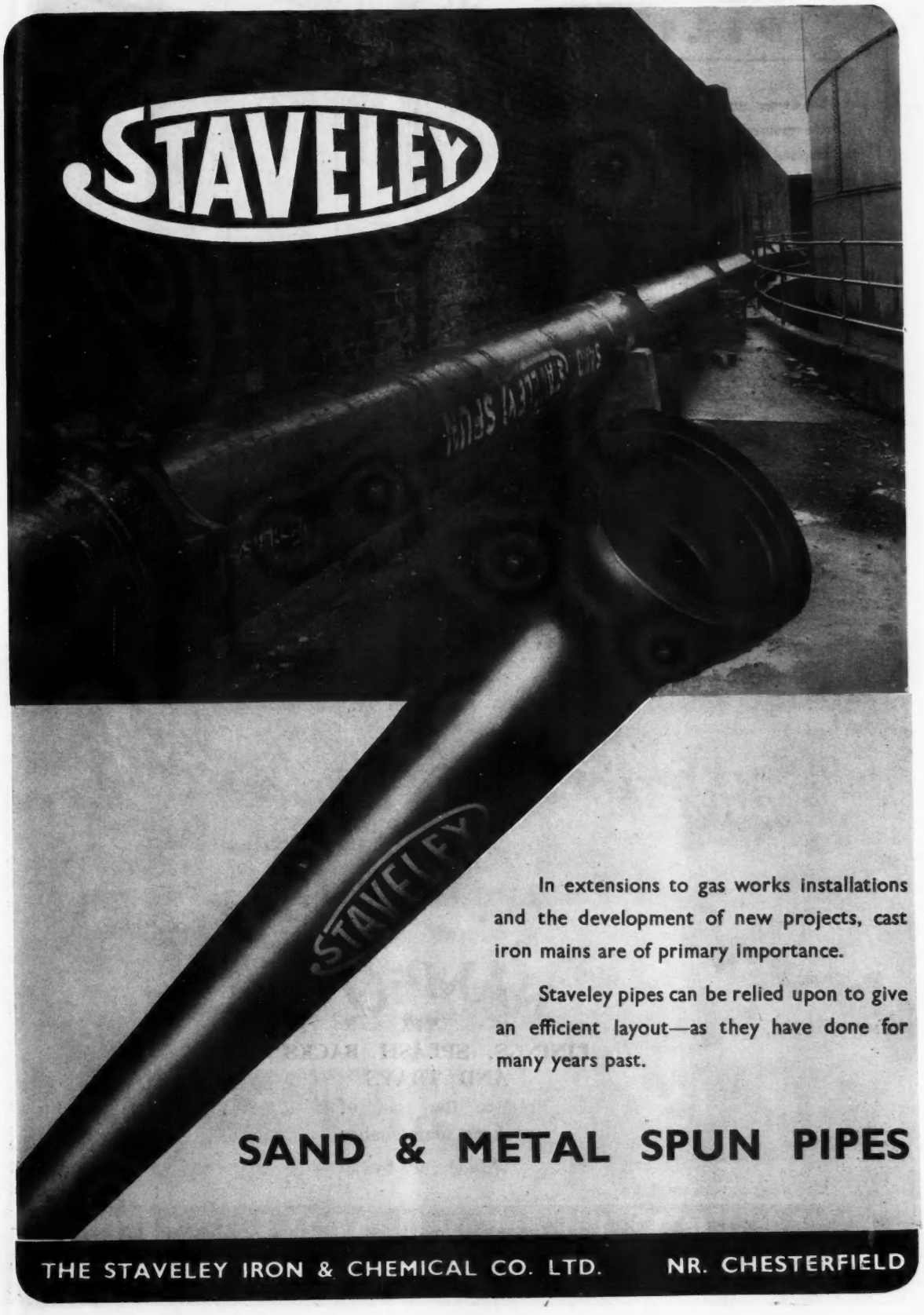

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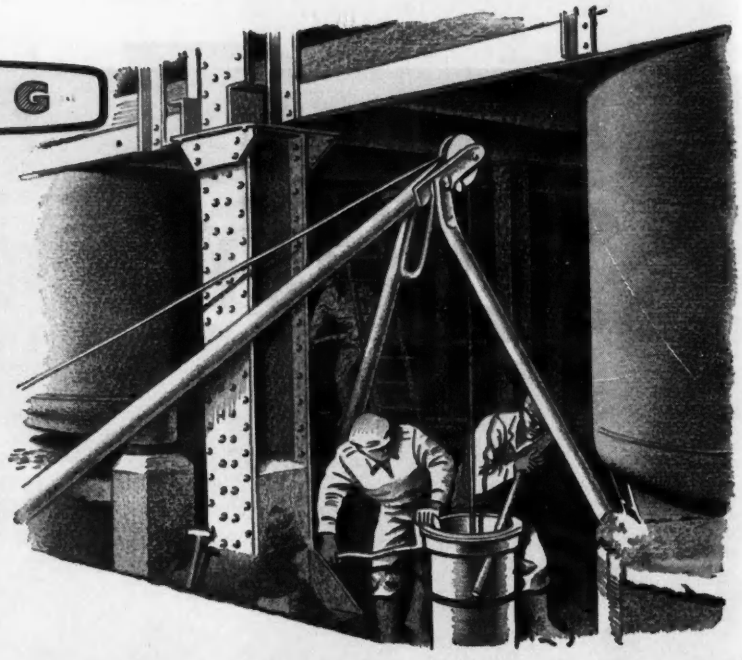

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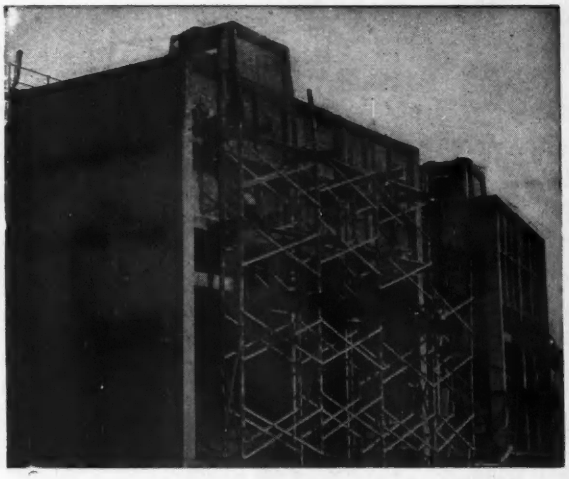
Gunite



One of the reinforced concrete structures reconditioned with Gunite for the City of Carlisle Gas Undertaking.

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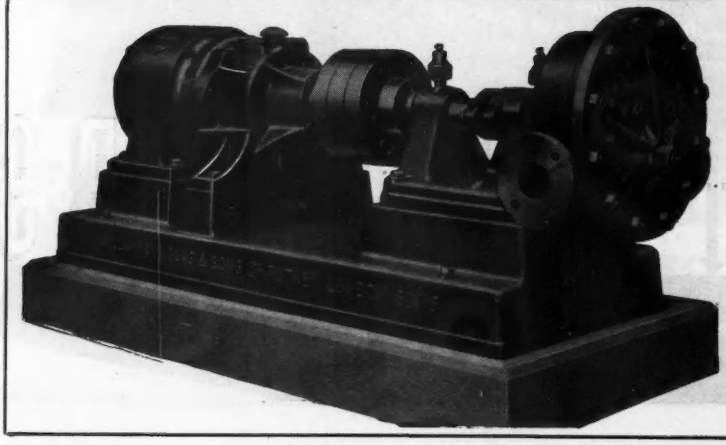

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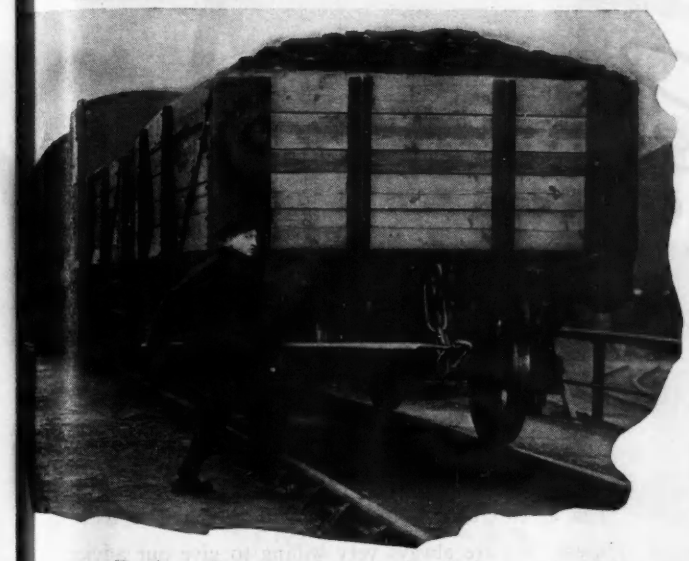

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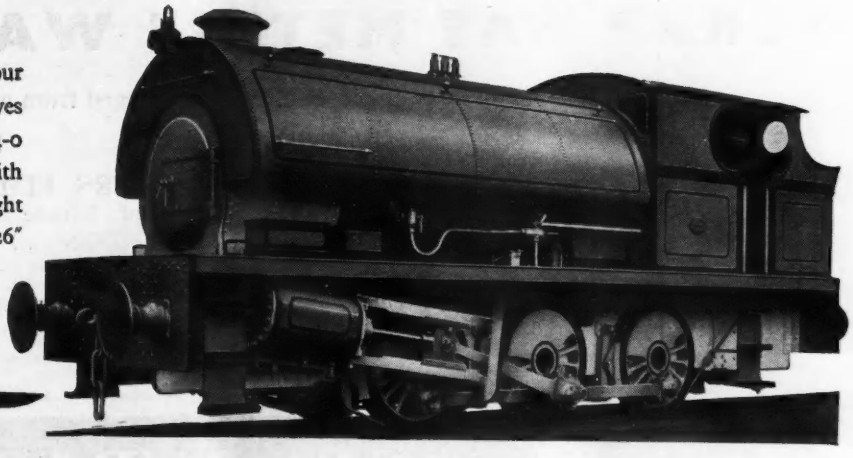

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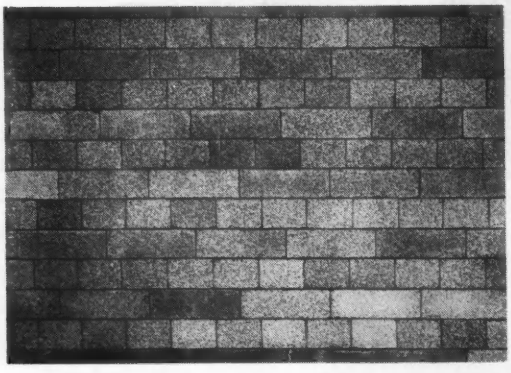

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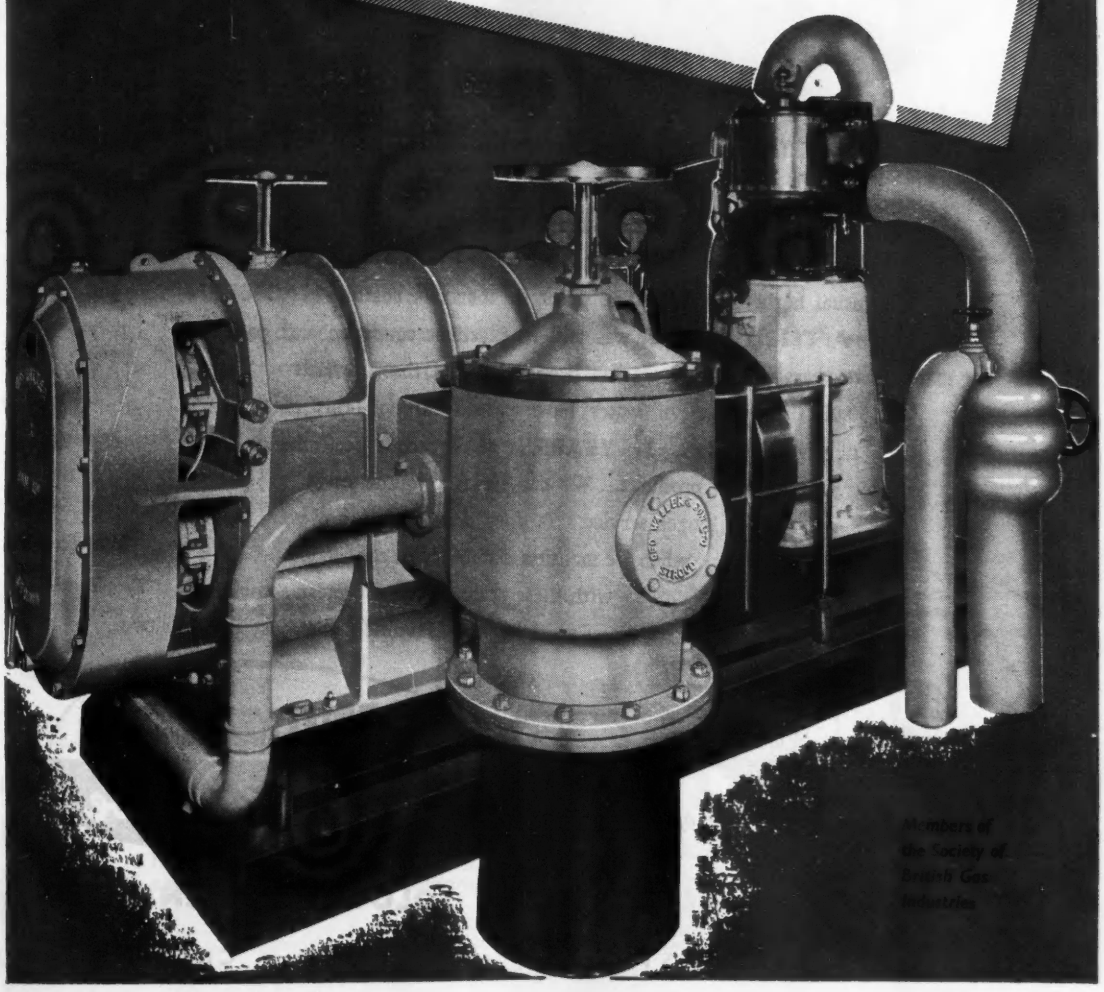

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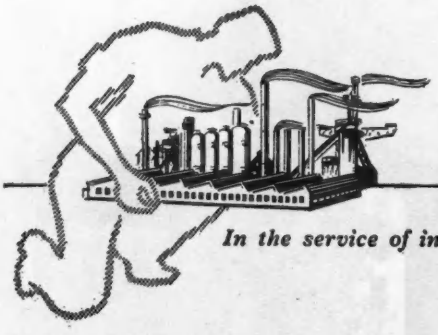
We feel a little proud of this . . .

View of water tank, shortly to be demolished to make way for new plant. Note the condition of the Enamel coating.

With kind acknowledgements to The Newcastle Breweries Limited.

We had a call from a customer recently, to come and see a concrete water tank which had been coated with "Bitumastic" specialities. Our customer expressed his satisfaction at the job and after examining it ourselves, we agreed it was up to our usual high standard. The point is, that this coating **HAD BEEN APPLIED IN 1913**, was still in excellent condition and good for many more years of service. It has been calculated that upwards of 50,000,000 gallons of water have passed through this tank during its lifetime. **39 YEARS** is not a record performance for "Bitumastic" products. We can, in fact, quote cases of longer service. It does demonstrate however, that when we mention durability in connection with these materials, we do mean something which will last more than just a year or two . . .



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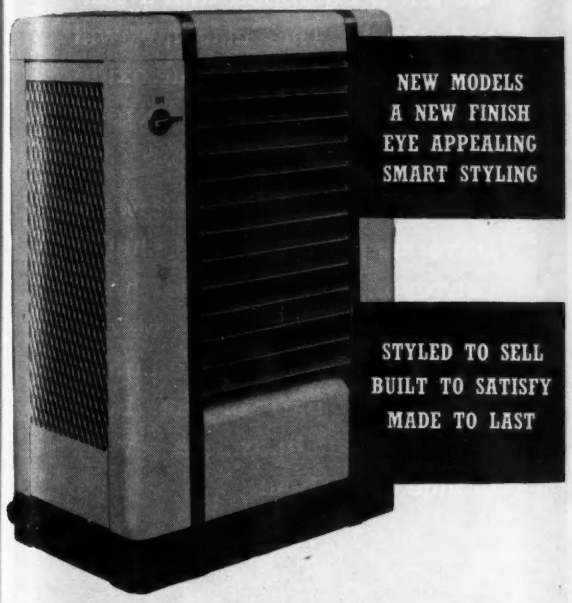

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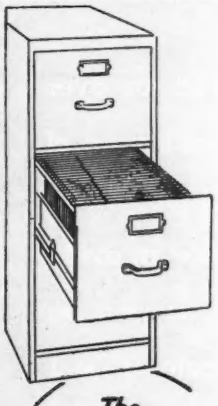

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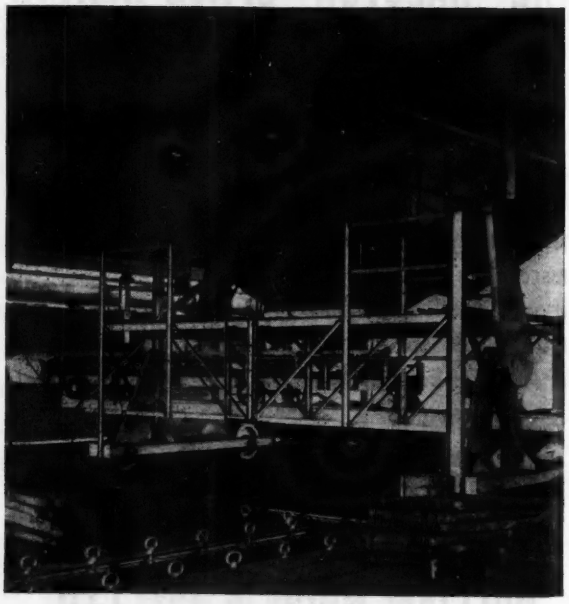

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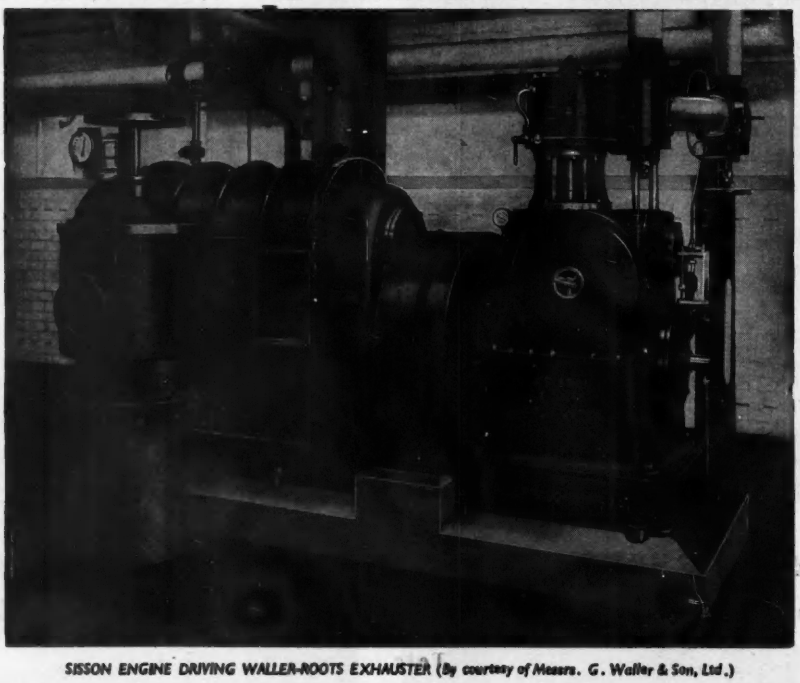

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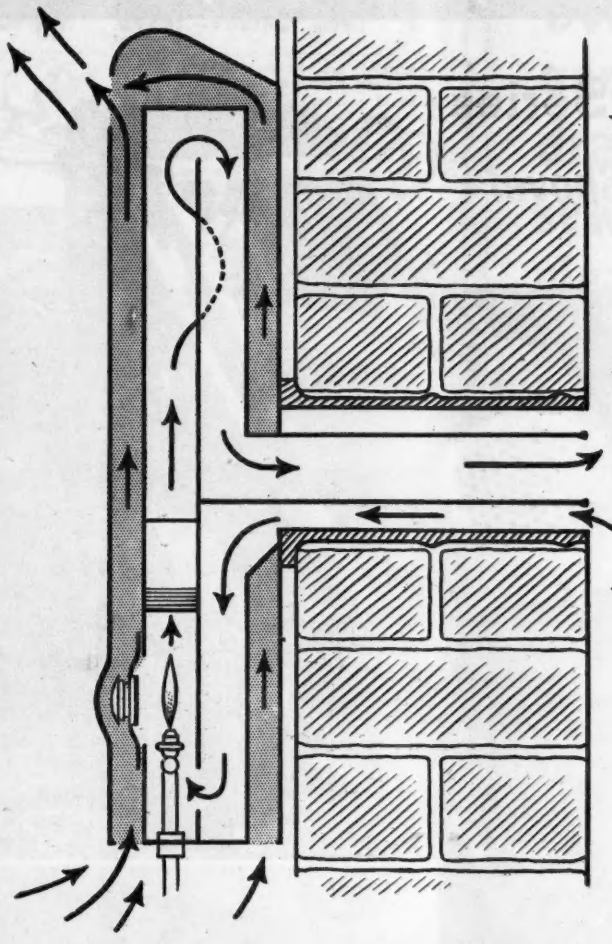

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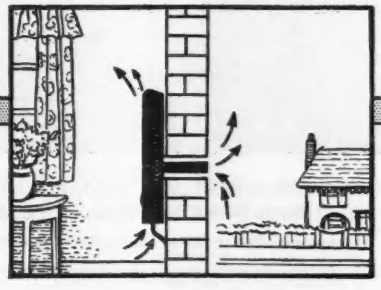

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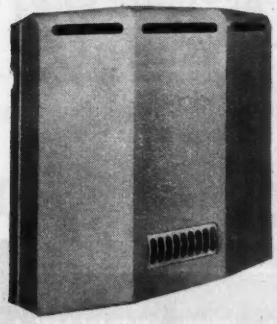

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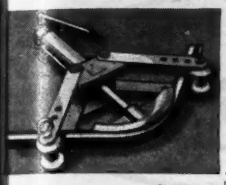

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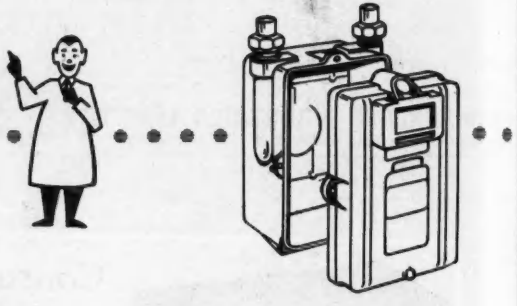

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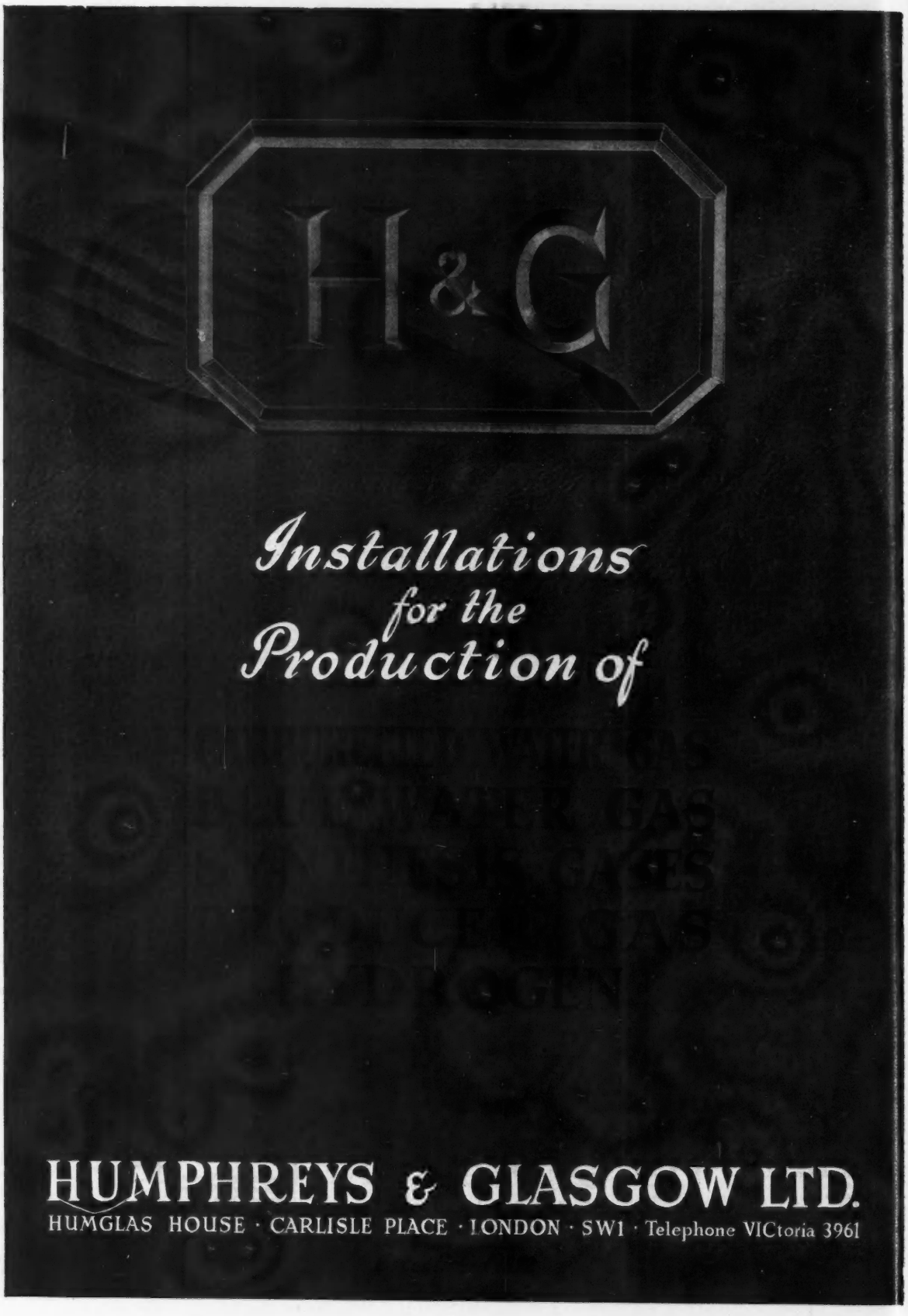
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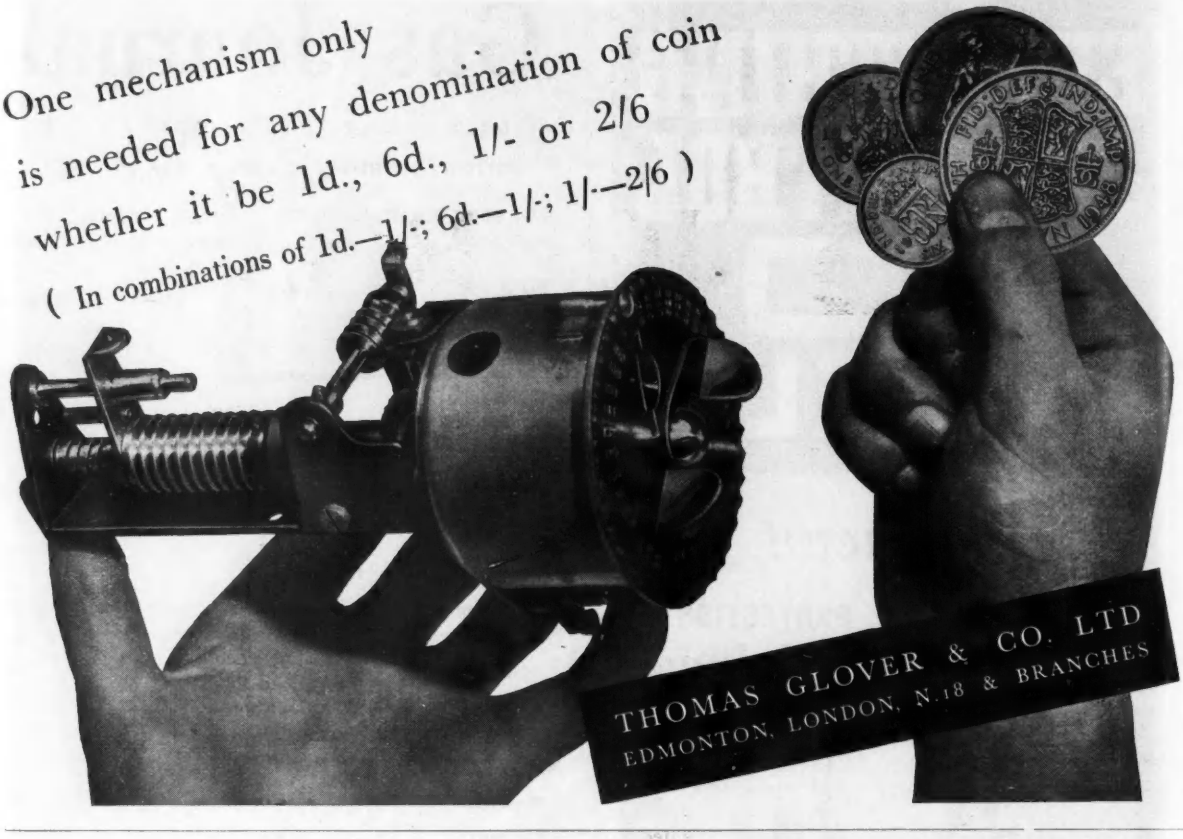

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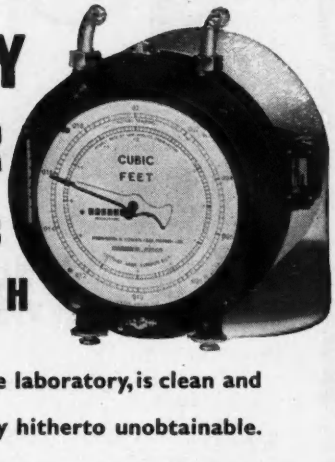

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VOL. 272. No. 4662 104TH YEAR OCTOBER 8, 1952

THE CONTROVERSY OVER FUEL EFFICIENCY

A STUDY of the Appendices to the Ridley Report will show that the Gas Council is to be congratulated, at least by gas men, upon the evidence it submitted to the Committee and particularly on its spirited reply to the case for electricity. The view that appeared to underlie that case, 'that the welfare of the electricity supply industry is an end in itself,' seems unfortunately to underlie a good deal of the report as a whole. Every effort seems to have been made to whittle away the poor impression created by the low thermal efficiency of the use of coal for the generation of electricity. The ability of the power station to burn inferior grades of coal is repeatedly stressed. The retort of the Gas Council to this claim is good. That low grade coal *can be so usefully employed* is fortunate, but it is indeed doubtful whether this can be stretched to the assumption that 70 mill. tons of coal out of the 200 mill. available is of such poor quality that it could be used by no one else. The Gas Council does well to insist on the importance of coal economy as the over-riding factor in the argument—and to call attention to the persistent practice of the British Electricity Authority to exclude gas from the new housing estates as far as it can. By the way, it may be noted here that the Trades Union Congress suggests that 'it would be justifiable to protect (*sic*) the electricity peak load by preventing the development of all-electric estates.'

The gas case was somewhat impaired by the unfortunate incidence of what is now getting too firmly established as the formula for gas production efficiency. The thermal efficiency of the whole process based on figures of Table A (page 76 of the report)—and be it noted that these are the overall figures of the whole industry over the year's working—works out at 72.5%. Gas production efficiency is calculated at 53.6%. The objection to this formula—and to this result—is that it assigns all the losses in the process to the gas. If these losses are divided up proportionately between the gas and the by-products we should have the expression, therms of gas sold divided by thermal value of coal less that of the by-products plus their share of losses. If our arithmetic is not at fault this would come to 73.15%—a little better, that is, than the efficiency of the process as a whole. What is the objection to that? It is very desirable that something like this should be done because when it comes to allowing for losses in distribution these hit gas again. Distribution efficiency of 90.3% would reduce this 'real' combined efficiency of gas production and distribution to something like 66%, instead of the 48.4% arrived at the other way.

But perhaps the more significant items of evidence are those of bodies not directly interested in either gas or electricity. The Federation of British Industries sets out the elements of a national fuel policy. It sustains the contention that shortage of coal is likely to be acute 10 years hence. Its estimate of domestic demand for raw coal, for instance, in 1960-65 is 40 mill. tons if the present restraint is removed, if the present trends are maintained and allowing for an increased use of coke—a net increase, that is, of 7 mill. tons. And the overall deficit is likely to be some 70 mill. tons (a figure in which the N.C.B. concurs) against an estimated increase of output, not repeated in the National Coal Board's own evidence, which has been put at not more than 20 mill. tons. The N.C.B. itself says roundly: 'The only safe assumption is that every additional ton of coal produced . . . . will have to be earmarked for essential export.' And again, 'it would be unwise to base national policy on the expectation that coal output will rise sufficiently to produce a fundamental change in the situation.' The only way is so to improve the efficiency of coal utilisation that growing demands can be met without increasing inland coal consumption.

The inference is overwhelming. Coal economy must be the keynote of national fuel policy. As to alternative forms of energy the F.B.I. is emphatic. It is no good looking wistfully to atomic energy. In the near future the need seems to be to encourage the application of existing knowledge to the efficient production and efficient use of established fuels.

The Trades Union Congress is equally emphatic. It is not satisfied that the matter has yet received the urgent attention from the Government which it merits—and we do not think the Congress is using the word Government with any political meaning.

The T.U.C. is generally guarded in its comparisons of gas and electricity, but even the T.U.C. regards it as 'evident that electricity is being used for purposes for which its overall thermal efficiency is low—in many cases because the real cost of the supply is not recovered from the users.' It finds that in spite of the difficulties with capacity the B.E.A.'s attitude on the subject of tariffs is still based almost entirely on sales promotion, while the present basis of its tariffs does nothing to discourage the piling up of consumption at difficult times of the day and the maintenance of excessive generating capacity. On the other hand an 'important element,' the T.U.C. says, in a national fuel policy must be to encourage coal carbonisation. Capital investment and expansion of the capacity of gasworks 'should receive a very high degree of priority.'

The National Coal Board is definitely in favour of gas to meet the intermittent heating load. Little, if anything, it says, would be gained if the intermittent heating jobs now done by electricity were taken over by solid fuel. 'Here the obvious choice is gas'—which would in most cases 'be helpful from the point of view of coal economy for it takes roughly twice as much coal to produce an equivalent heat value by electricity as it does by gas.' The Board is therefore of the opinion that every effort should be made to shift the heating load away from electricity to gas, coke, etc.

The Trades Union Congress insists on the necessity for a high degree of co-ordination of the several fuel authorities—a suggestion which, to put it mildly, was not accepted by the Committee. Both are agreed, however, that the several nationalisation Acts give sufficient power to the Minister, a power which he already had under the Ministry of Fuel and Power Act itself, to secure the effective and co-ordinated development of the several sources of fuel and power and to promote economy and efficiency in supply and utilisation. The T.U.C.'s recommendation is that a Fuel and Power Council should be established as soon as possible composed of representatives of the three nationalised fuel authorities, as well as of other interests, with a chairman appointed by the Minister. The choice of chairman would be most important—'he would need to have considerable ability, tact and firmness.' The Council should not have executive power. Its most important duty, after that of advising the Minister, would be to present a report to be submitted by the Minister annually to Parliament.

It may be questioned whether such a Council with its wide membership and diffused functions would be as effective as the two bodies suggested by the Committee, each with a definitive duty. But in any case it seems to be established that the Minister himself has already been assigned the duty of setting forth his policy over the whole field. Parliament should insist that this duty, at least, is regularly fulfilled.

WHITLAND GAS

EIGHT months after the experimental change over from horizontal retort gas to a butane-air mixture in the little South Wales village of Whitland, Mr. E. M. Edwards, on whose advice the Wales Gas Board embarked on the experiment, has presented to the industry through the Wales and Monmouthshire Section of the Institution of Gas Engineers a very interesting account of what has so far been achieved and a pointer to future development. His paper, to which we devote several pages of today's issue, should not be regarded as more than an interim report, but so far as it goes it holds out great promise. Not only the Wales Gas Board, but at least two others—the South Western and the Eastern—are considering the installation of butane-air plants in certain selected isolated districts, and as we reported earlier in the year the Gas Council regards the Whitland installation as a pilot experiment of national significance. The Watson House laboratories of the North Thames Gas Board have taken an enthusiastic interest in the scheme from the point of view of adapting appliances for use with the new mixture, and the contracting side of the industry—as witness the paper by Dr. W. T. Cosby to the Irish Gas Association last month—has proved itself fully alive to the potentialities of the new development. The appliance manufacturers have shown ingenuity and resource in catering for the new demand, and we understand that even in the case of the one exception mentioned during the Ruthin discussion—the lack of a multipoint water heater capable of burning Whitland gas—steps are being taken to make good the omission. The whole thing has been a shining example of co-operation and the exercise of the team spirit.

The starting point of Mr. Edwards's investigations was the fact that some small gasworks in Wales had long since closed down under the economic strain; many outlying communities had never been provided with gas supplies; and a large number of isolated works were quite incapable of being brought within range of bulk supplies on economic terms from larger undertakings. Through the courtesy of officers of Gaz de France, Mr. Edwards and some of his colleagues in 1950 examined processes that were being developed for the utilisation of liquefied petroleum gases by the gas industry in France, and they concluded that with certain reservations there was a field for similar development in Great Britain. Since the Whitland plants—one imported from France through British manufacturers and one purchased direct from America—started up Mr. Edwards has visited the United States as a member of the gas industry productivity team, whose report, which has not yet been issued, will undoubtedly contain additional and valuable information.

Introduction of butane-air supplies involves the development of a new technique to deal with gas heavier than air and of a nature quite different from that to which we are accustomed, and Mr. Edwards, in his paper, described the steps that were taken, and the subsequent developments, under the headings of choice of calorific value; survey of the undertaking;

investigation into the use of various mixtures; conversion of district system and appliances; change-over from coal gas to butane-air; installation and description of the plants; results and experience gained with plant and district; capital and operating costs; general policy and installation design.

It seems to us that there are three aspects from which the Whitland experiment will ultimately be judged—namely, the purely technical; the economic; and the point of view of consumer satisfaction. As regards the first and the last, experience to date has been so completely satisfactory that some of the Board's chief officials almost wish something or other would go wrong, to make matters a little more exciting. The economic results are a little more obscure. Costs of the Whitland experiment are not given, because Whitland was treated as a research station where two plants were installed and extensive experimental work was carried out on the works and district. Before any substantial developments take place long-term contracts for the supply of liquefied petroleum gases on acceptable commercial terms must be made. The large extensions now taking place in the oil refinery industry indicate that substantial quantities of these products will become available within the next few years, though a reasonably accurate estimate can only be prepared by the oil refiners. Consumers' requirements and the resultant relative ratios of petroleum products can change, as is illustrated by the development of jet engines, which will tend to displace piston type engines using petrol as the source of energy. Butane is being used to an increasing extent for bottled gas purposes, and the use of liquefied petroleum gases by the chemical industries may develop. Of the existing and contemplated 13 major producing centres for L.P. gases in Great Britain, the refineries at Llandarcy and at Stanlow are those most conveniently located for distribution of L.P. gases in Wales. Regard must be had to security and continuity of supplies in circumstances of national emergency because the raw material for the process emanates from an imported product.

Mr. Edwards claims that the use of L.P. gases can make a contribution to coal economy, for one ton of L.P. gas is about equal to 7.3 tons of coal used in hand-charged horizontals. The process is technically sound and provides a gas of very constant calorific value and composition. In paying deserved tribute to Mr. Edwards at the end of a helpful discussion, Mr. T. Mervyn Jones, Chairman of the Wales Gas Board, said that since January the demand for gas at Whitland had steadily increased up to the present weekly output of 554 therms, which is an increase on a thermal basis of 19.7% compared with the corresponding period of last year, when coal gas of about 450 B.Th.U. was being distributed. It would not be surprising if, by way of acknowledgment of the contribution which the Wales Gas Board is making at its own expense to the wider understanding and adoption of butane-air, the product assumes the colloquial and easily-understood name of 'Whitland gas.'

MALTA'S FUTURE

THE concession under which the Malta and Mediterranean Gas Company operates its gas undertaking in the famous George Cross island is due to expire at the end of next month, and negotiations which the company has tried to carry on with the Government have so far failed to yield any decision as to what will happen on and from December 1. The concession, it appears, is little more than a building lease of the gasworks, which reverts to the Government on its expiry. According to the company's legal adviser failure to reach agreement in the meantime will probably leave the Maltese Government on December 1 with a gasworks but without a distribution system, and the company with its main and services, and between 3,000 and 4,000 consumers on its books but with no source of gas supply. Mr. G. Murray Burton, Deputy Chairman and Managing Director, told the annual general meeting that the present unsatisfactory position was due to Government inaction—'no less than procrastination'—but he still hoped that a settlement would be reached by the end of November. At an extraordinary general meeting the directors were empowered to negotiate for the continuation of the administration of the undertaking, or failing that, to operate temporarily as agents for the Maltese Government providing terms were satisfactory. It was a matter for keen personal regret that Mr. A. M. Paddon, director for 52 years and Chairman for 34 years, was absent for the first time, under doctor's orders. Mr. Paddon has never written a speech in his life, but his discourses at the annual meetings of the many gas companies over which he used to preside have always been outstanding examples of the finest use of the English language.

BECKTON EXTENSIONS

OF the Beckton works one has come to expect big things. But size alone does not necessarily spell efficiency. The North Thames Gas Board ever seeks to incorporate features which lead the way either in increased efficiency or enhanced amenities or both. In keeping with this 'pioneering' tradition are the important extensions inaugurated at Beckton last week by the Chairman of the Gas Council, which form the subject of a special article on later pages today. On the production side, carburetted water gas plant will, when completed, nearly double the existing water gas capacity of 42 mill. cu. ft. per day. The section already completed comprises four Humphreys and Glasgow generators each of 4½ mill. cu. ft. per day, while three further Power Gas units, each of 6 mill. cu. ft. per day, are going up alongside. In combination with the completed section are waste heat boilers capable not only of supplying all the steam requirements of the water gas plant, but of providing, by means of the largest induction generator of its kind in Europe, enough electricity for all the blowers, exhausters, pumps, and mechanical handling equipment serving the plant, plus a surplus for the works 'grid.' The new boiler plant inaugurated at the same time comprises four Babcock & Wilcox water tube boilers each capable of an output of 40,000 lb. of steam per hour. This building was designed by the Board. Along with these two major installations are a fine new 'lobby' building for the workmen, embodying many modern features, and large mechanical workshops and engineering stores capable of undertaking every kind of maintenance work from the complete overhaul of the works railway locomotives down to the fabrication of the smallest types of fittings.

If we may add a personal note, it is to express appreciation of the admirable arrangements whereby the trade and technical Press were enabled to get a 'preview' of

the new extensions under the expert guidance of Dr. J. Burns, the Board's Chief Engineer, Mr. H. Bradley, the Station Engineer, and other senior members of the Beckton staff, in an atmosphere of friendly informality.

Personal

Mr. G. A. T. Burdett has joined Holophane, Ltd., as Publicity Manager in succession to **Mr. R. J. W. Briddon,** who now represents the company in the South Western area. Mr. Burdett has held a number of publicity posts including Public Relations Officer with the Plessey Co., Ltd., and Advertising Manager to the Dowsett group of companies. Immediately prior to joining Holophane, he was with Service Advertising Co., Ltd.

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Sir Wallace Akers, C.B.E., F.R.I.C., and **Sir Philip Johnson** have been appointed members of the Advisory Council for Scientific and Industrial Research from October 1. Sir Wallace Akers is a director of Imperial Chemical Industries, Ltd., and Sir Philip Johnson is a Director of Hawthorn Leslie and Co., Ltd., and Chairman of the Parsons and Marine Engineering Turbine Research and Development Association. **Professor P. I. Dee** retired from the Council on September 30, on completion of his term of office. **Sir Hugh Warren** has resigned his membership of the Council because of the pressure of other duties.

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Mr. F. P. Fall, Chief Engineer of the Sunderland undertaking of the Northern Gas Board, has retired after 50 years' service to the industry. A native of Huddersfield, Mr. Fall served his apprenticeship with W. C. Holmes & Co., Ltd., of Huddersfield, moving to Sunderland 43 years ago as a junior draughtsman at the Hendon gasworks. Before his appointment as Chief Engineer in 1945 he was successively chief draughtsman, engineering assistant, and deputy chief engineer. Mr. Fall was presented with a set of coffee tables on behalf of the workpeople by Mr. Andrew Leonard, one of the employees. Later in the day a presentation was made by Mr. W. O. Kirkwood, Divisional General Manager, on behalf on the staff.

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Mr. J. W. Broad is reliquishing his position as Director and Sales Manager of the Parkinson Stove Co., Ltd., on November 1, and has been appointed Director and General Manager of Parkinson & Cowan Group Exports, Ltd. In consequence, the Parkinson Stove Co., Ltd., announce that **Mr. J. L. Anstey,** formerly Midlands Area Manager, has been appointed Sales Manager of the Parkinson Stove Co., Ltd.; **Mr. C. T. C. Woodall** has been appointed London and Home Counties Sales Manager with added responsibilities; **Mr. K. F. Hollingsworth** has been appointed Midlands Area Representative and will be responsible for sales to the West and East Midlands Area Gas Boards; and **Mr. W. H. Powell** has been appointed Publicity Officer. All these appointments are effective from November 1.

Obituary

BERNARD R. PARKINSON

Mr. Bernard R. Parkinson, until recently a Director of Parkinson and Cowan, Ltd., died at Worthing on September 27 after a short illness, as briefly reported last week. Mr. Parkinson was born in London and educated at New College, Eastbourne, and London University. He served a pupilage at Birmingham gasworks under the late Mr. Charles Hunt. After a short period in which he ran a foundry business of his own, he became associated with Corbet Woodall and Son, Consulting Engineers, and during that time visited Barbados and reported on the gas undertaking there. He specialised in distribution and made a particular study of unaccounted-for gas. He did considerable pioneer work in furthering the use of steel mains and invented the ring sleeve joint for tube connections and the expansion nipple for services. He wrote a book in conjunction with the late Mr. Henry Woodall entitled *Distribution by Steel.*

During the 1914-18 war, Mr. Parkinson served for a period in France with the Y.M.C.A. after which he was engaged by the Gas Light and Coke Company to investigate its unaccounted-for gas which had risen during the war period.

In 1918, Mr. Parkinson joined the Board of Parkinson and Cowan. He served for five years on the Life of Gas Meters Committee founded by the Institution of Gas Engineers and the Society of British Gas Industries, preparing the committee's reports in collaboration with the late Mr. J. C. Taplay, Chief Analyst to the company. The scope of this committee work was expanded to cover internal corrosion of mains and services as well as meters, and as an outcome there were further inventions in the methods of lubricating meters by spraying and on vapourising oil into gas mains. During his time with the company, he concentrated on problems of metering and governors and in 1947 he published a text book *Governors and Governing.*

He made the welfare of the employees his special concern and in like manner was keenly interested in the work of the Benevolent Fund of the Institution of Gas Engineers.

In private life he was a fine amateur pianist and just before his retirement from Parkinson and Cowan, Ltd., in 1950 gave a recital at the Kennington works to a large audience of employees. He was a man of strong religious convictions and was guided in all he did by principle.

Mr. F. W. ROBINS, F.S.A., F.R.G.S., author of *The Story of the Lamp* and other works, writes: In over 50 years' experience of the gas industry and of communal life, Bernard Parkinson was the straightest man I have ever known. That is no reflection on my many other good friends, but B.R.P. was exceptional in his rigid adherence to principle, at all times and in all circumstances. Not that he was of the stern and dour puritanical type—he could enjoy a joke, interest himself in other people's activities (as he did very thoroughly and very kindly in my own case) and be ever anxious to do a good turn. When the Institution of Gas Engineers met at Bournemouth, he surprised me by telling me he had just been for a swim; he was in the eighties. More than that, discussing an article by Sir Paul Dukes (whom I also knew) in which that gentleman expatiated on the healthy exercise of standing on one's head, B.R.P. told me he could do it too!

I first met him when he was in charge of mainlaying operations for Corbet Woodall and Son, during which period he invented the 'rigid' type of joint for steel mains. Later, he invented the Woodall-Parkinson expansion nipple for making service connections in steel mains, the experiments in connection with which were made at my old company's works at Landore, South Wales. Coupled with his authorship of *Distribution by Steel* and his researches, under the auspices of the Institution of Gas Engineers, into the dust accumulation in high pressure mains and services, these activities brought me into constant contact with him and started a friendship which I have valued highly; the more years that passed, the more I, and I think all those who worked with and met him, grew to respect his real goodness and integrity.

Withal, he was a modest man; I had known him for years before I discovered that he was an accomplished pianist. I once persuaded him to give a recital to a North London Literary Society of which I was secretary, and, in my inexpert judgment, he gave a performance greater than that of some professionals I have heard. He was a religious man, in the best sense, but no dogmatist. I have a book compiled by him, *God's League of Nations,* which rests side by side with his *Distribution by Steel,* and *The History and Recent Development of the Wet Gas Meter,* on a special shelf devoted to books by men and women I have known. They will always have an honoured place in my library, if only because their author was a great man in the true meaning of the word, and I feel that his passing is a personal loss.

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His many friends in the gas industry will learn with regret of the death of **Mr. S. Mottram,** Commercial Manager of Cannon (Holdings), Ltd.

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Mrs. Ellen Pye, widow of the late Mr. F. A. Pye, who for many years until his death in 1926 was General Manager and Secretary of the Chester United Gas Company, died at her home at Abergele, North Wales, on September 24, in her 90th year. She is survived by a daughter and two sons, one of whom, Mr. H. V. Pye, is Unit Controller and Station Engineer at Cheltenham.

Queen Mother's Interest in International Kitchen

REPRESENTATIVES from 23 countries will present their national dishes at the Royal Festival Hall on November 4 and 5, when the Gas Council's 'International Kitchen' will hold its first exhibition.

Queen Elizabeth, the Queen Mother, has expressed great interest, and will inspect the 19 special kitchens on the opening day. These have been set up by the Gas Council. This unusual exhibition will be open for public inspection on November 5. Admission is free.

The Gas Council feels that such an exhibition at the present time would be of great service to British housewives (who, after all, form nearly 70% of the consumers of gas). The Council also feels this display of internationally famous dishes will stimulate the imagination and give housewives new and exciting ideas for preparing meals with food that is available to them. The exhibition will show, too, that however strange and exotic a dish may be, it can be perfectly produced from a gas cooker.

What happens to the food? It will be distributed by the Red Cross Society to homes and institutions which care for the needs of nationals of the countries represented.

And the recipes? The Gas Council plans to have all the recipes produced in an 'International Kitchen' book. This book, however, will not be available at the exhibition, but will be on sale at a later date. The demonstrators for the British team are Miss Joyce Wilkinson, Senior Home Service Adviser, Bolton Division, North Western Gas Board; Mrs. Joyce Prole, Consultant Home Service Adviser, Cambridge division, Eastern Gas Board; and Mrs. Stephen Brown, Home Service Adviser Smethwick Division, West Midlands Gas Board. They are the winners of a competition among home service advisers employed in the gas industry. The menus they will use will be based on a week's meat ration for a family of four people.

Full Co-operation from Boards

Dame Vera Laughton Mathews, D.B.E., Adviser on Women's Affairs to the Gas Council, gave details of the project at an advance Press conference on September 30. Dame Vera said the area boards have promised full co-operation, so the exhibition, which is really a 'United Nations on the Domestic front,' will be representative of all parts of the country.

At least five countries are sending demonstrators from abroad. France is sending three and the German team will be selected by a competition among domestic science students. Their prize will be a visit to England to take part in 'International Kitchen.' Denmark, Italy, and the Netherlands, and possibly two other countries, are sending demonstrators to London especially for the exhibition.

After the exhibition, visitors from abroad will visit other parts of England as guests of area boards. The French team is going to Bristol, the German team to Manchester, the Dutch representatives to Birmingham, and the Danish to Sheffield, where they will all give demonstrations and be entertained for a few days.

The other teams will be composed of foreign nationals resident in this country —most of the names having been obtained from the Embassies. The Indonesian team has been arranged personally by Madame Subandrio, the Ambassador's wife, and the leader of the Malayan team is the granddaughter of the Sultan of Johore, Princess Khatijah, who is resident in London.

A special attraction of the exhibition will be a fashion parade of house and kitchen ware.

Diary

Oct. 10.—London and Southern Juniors: Meeting. Presidential Address by C. D. Shann.

Oct. 10-11.—North Western Gas Board: Annual Staff Conference, Blackpool.

Oct. 11.—Manchester Juniors: Annual General Meeting, Blackpool. Presidential Address of A. K. Howell.

Oct. 14.—Wales Juniors: 'Any Questions.' Grand Pavilion, Porthcawl, 2.30 p.m.

Oct. 16.—Institution of Mechanical Engineers: Annual Dinner, Dorchester Hotel, Park Lane, 7 for 7.30 p.m.

Oct. 17.—Institution of Chemical Engineers (Graduates' and Students' Section, North East Centre): 'Gas Engineering,' A. J. Pringle. At Newcastle.

Oct. 17.—Midland Section, I.G.E.: Visit to Four Ashes works of Midland Tar Distillers.

Oct. 17.—Institution of Mechanical Engineers: General Meeting, Presidential Address of Sir David Pye, C.B., 'The Art of the Practical Engineer,' 5.30 p.m.

Oct. 18.—Institution of Chemical Engineers (North Western Branch): 'Further Training of the Chemical Engineer,' Stanley Robson (President), Manchester College of Technology, 3 p.m.

Oct. 20.—Institute of Fuel: Melchett Lecture, Dr. D. T. A. Townend, C.B.E., at Institution of Mechanical Engineers, Storey's Gate, S.W.1.

Oct. 21.—Scottish Juniors (Western): Evening visit to Braehead Power Station, Renfrew.

Oct. 21.—Midland Juniors: 'Organisation for Efficient Control in a Modern Large Retort House,' C. P. Astbury, Birmingham; Staff Mess Room, Council House, Birmingham.

Oct. 21.—London and Southern Section, I.G.E.: Annual General Meeting, 'Some Aspects of Calorific Value' J. T. Veryard, South Eastern Gas Board; at 17, Grosvenor Crescent, S.W.1, 2.40 p.m.

Oct. 21-22.—Combustion Engineering Association: Conference on 'Operation and Maintenance of Industrial Boiler Plant.' Grand Hotel, Harrogate.

Oct. 21.—Eastern Juniors: 'Gas Meters and Their Development,' S. Armitage (W. Parkinson & Co., Ltd.), at Bedford.

Oct. 21-24.—Dairy Show, Olympia: Gas Council exhibit, stand 146/147.

Oct. 23.—Midland Juniors and Yorkshire Juniors: Joint visit to Standard Motor Co., Ltd.

Oct. 25.—London Juniors: Afternoon visit to Willoughby Lane, Tottenham, depôt of William Press & Son, Ltd. 2.30 p.m.

Oct. 28.—Midland Section, I.G.E., and **Midland Branch, Institute of Sewage Purification:** 'Treatment of Gasworks Liquor in Admixture with Sewage in Percolating Filters,' W. H. Blackburn, PH.D. (ex Gas Research Board), T. G. Tomlinson, M.SC., M.INST.S.P. (Water Pollution Research Laboratory), and T. H. Summers. At Birmingham Chamber of Commerce, 2.30 p.m.

Oct. 29.—Institution of Gas Engineers and **Coke Oven Managers' Association:** Joint Meeting, 'Selection of Gas Manufacturing Plant in Relation to Supplies of Coke Oven Gas,' F. G. Pyper, East Midlands Gas Board, at Institution of Civil Engineers, 2.30 p.m.

Oct. 30.—North Thames G.C.C.: Westminster City Hall, W.C.2. 2.30 p.m.

Oct. 30-Nov. 1.—North Eastern Gas Board: Conference of Senior Officials, Harrogate.

Nov. 3-8.—Public Works and Municipal Services Congress and Exhibition, Olympia. Institution of Gas Engineers session, Nov. 5: 'The Gas Industry's Contribution to the Fuel Services of the New Town,' W. G. Phillips, M.A., A.M.I.C.E.; 'The Cremation Movement in Great Britain with special reference to Cremator Design,' W. R. Pearson, A. Higgs, and R. H. Anderson. Gas Council exhibit, Stand No. 161.

Nov. 4.—East Midlands G.C.C.: Town Hall, Sheffield, 11.30 a.m.

Nov. 4.—'International Kitchen.' Royal Festival Hall. Exhibition of international cookery sponsored by the Gas Council.

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BIG EXTENSIONS AT BECKTON

Thursday of last week marked the inauguration by Colonel H. C. Smith (Chairman of the Gas Council) of three important new projects at the Beckton works of the North Thames Gas Board—all aimed to increase the output and efficiency of the world's largest gasworks. These extensions comprise a C.W.G. plant, a water tube boiler installation, and mechanical workshops with engineering stores, embodying the latest improvements from both the technical and amenity aspects.

Humphreys & Glasgow carburetted water gas house with Power Gas plant in course of erection alongside.

THE new carburetted water gas plant, built by Humphreys & Glasgow, Ltd., is housed in a ferro-concrete building. It consists of four single automatically operated generators fitted for back-run operation and having a combined capacity of 18 mill. cu.ft. per day of carburetted water gas at 500 B.Th.U.

The generators have an internal diameter of 9 ft. and are provided with dry sealed Haug grates which permit blast pressures of up to 60 in. w.g. to be employed. The grates extract the ash and clinker and deliver it into enclosed clinker pockets having sufficient capacity for eight hours working, between discharging operations.

Following each generator there are chequer filled carburettor and superheater vessels, followed by a horizontal type of fire tube waste heat boiler. The waste heat boilers raise steam at 300 lb./sq. in. superheated to 500-650°F., while the annular boilers of the generators raise saturated steam at about 30 lb./sq. in. Provision is made for dust extraction at the outlet of the generators and at the outlet of the waste heat boilers, prior to the stack valves, the latter being enclosed and situated outside the main building.

The high pressure steam from the waste heat boilers is supplied to a pass-out type of turbo generator of 1,400 kW. capacity, which provides all the electric power to drive the air blowers, exhauster, pumps and mechanical handling equipment, with a surplus available for the works system. The steam passed out from the turbine at 15 lb./sq. in. flows through two steam accumulators to smooth out the varying rates of steam production and demand, and thence to the process mains supplying the water gas generators at 7 lb./sq. in., where it is augmented by low pressure steam from the generator boilers and the surplus from the coke oven producer plant. The steam system is balanced by the quantity passing to the condenser of the pass-out turbo generator, this being automatically adjusted to the overall steam load conditions. The induction generator is stated to be the largest of its kind in Europe.

Coke supplies to the plant are conveyed by road transport and elevated to the service bunkers by twin skip hoists. The feeds from the bunkers to the automatic chargers on the generators pass over magnetic vibrating screens for removing small particles below 1 in. coke.

Alongside the new carburetted water gas plant a further extension is in course of erection, consisting of three 6 mill. cu.ft. per day Power Gas generators.

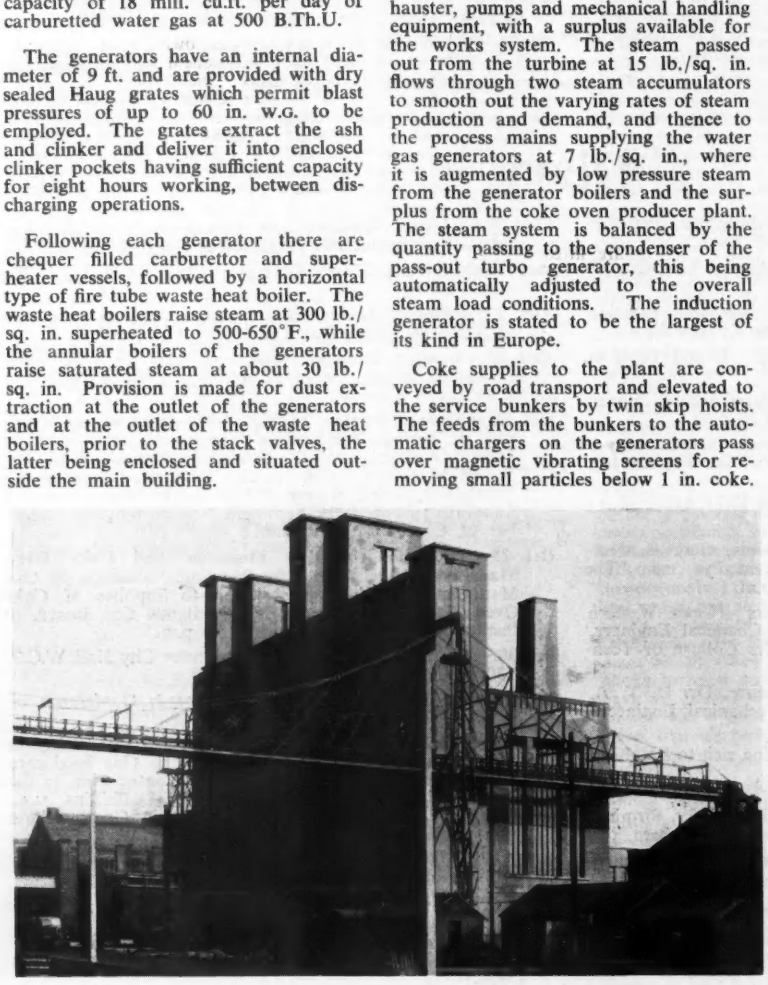
Adjacent to the water gas plant is a fine new 'lobby' building providing the most up-to-date facilities for 100 day workers on the first floor and a similar number of shift workers on the second floor, while the ground floor is devoted to stores accommodation. A feature of the 'lobbies' is the provision of two sets of steel lockers for each workman —the one for his ordinary clothes and the other for his working clothes, between which are fully equipped washing facilities.

Water Tube Boiler Plant

During the past few years additional gasmaking plant has been installed at Beckton and further plant is now in the course of erection. Due to this expansion, the demand for steam has increased and will increase still further. In addition, one boiler plant consisting of 12 water tube boilers is obsolete and at the end of its useful life.

The new boiler plant has, therefore, been built to replace the old boilers and augment the general steam production of the works. The new installation comprises four Babcock & Wilcox C.T.M. type water tube boilers, each capable of an output of 40,000 lb. of steam per hour at a superheater outlet pressure of 500 lb./sq. in., and a final temperature of 750°F. The boilers are operating at present at a working pressure of 300 lb./sq. in., and the high pressure will be used at a later date.

The boilers are steel cased and brick lined, with furnaces having suspended front walls and arches, all of the refractory Liptak type. Economisers of the gilled tube type are provided. The heating surface of the water tubes is 4,960 sq. ft. and the superheater 2,860 sq. ft. The heating surface of the economiser is 5,180 sq. ft.



The New Boiler House.

The boilers are equipped with Babcock & Wilcox style 28 stokers of the compartmented type, with travelling grates. Each stoker has a grate area of 252 sq. ft. The boilers have been specially designed to burn coke breeze, and ignition is assisted by re-circulating furnace gases through the incoming fuel bed by means of fans. The ash is quenched and removed by paddle ash extractors and delivered on to a conveyor belt and thence to an ash hopper. Grit re-firing equipment is provided, and the boilers are fitted with hydraulically operated automatic soot blowers.

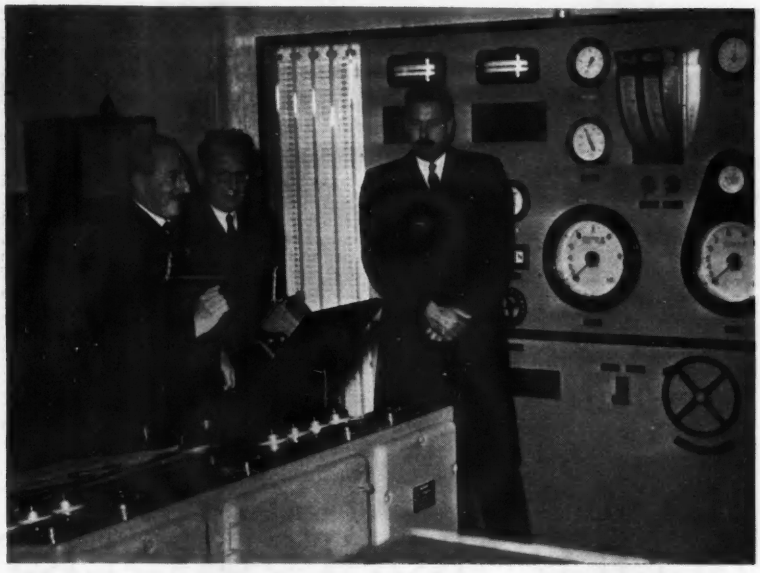
The four boilers are housed in a steel framed building with brick cladding, designed by the Board. The coke breeze fuel is brought to the boiler house by road vehicles and elevated to the bunkers by two counter-weighted skip hoists, each with a capacity of 30 tons per hour. The capacity of the bunkers is adequate for 48 hours' steaming. The boilers are provided with all the necessary instruments for efficient operation, and the thermal efficiency of the plant is about 75%.

Mechanical Workshops and Engineering Stores

The Products Works at Beckton is a self-contained unit provided with steam, electricity, and other services from its own plants. It has developed as the demand for gas has increased over the last seventy years, and by 1939 had reached a point where the existing plants and services were almost saturated. War-time damage and delayed maintenance contributed to the Board's decision in 1945 to re-build large portions of the works and increase their capacity, so that they might deal with increasing output of crude by-products efficiently.

Stages in the planned development of the works have been reached, including the completion of acid making plant, an advanced point in additional tar distillation plant, the replacement of a war-damaged works laboratory, the building of a welfare block, providing canteen accommodation, changing and washing facilities, in accordance with the Chemical Works Regulations, and now mechanical workshops.

To maintain the production plants and services a force of craftsmen in all the mechanical and building trades is employed, and it is their activities which will be housed in the workshops.



Colonel H. C. Smith (left) inaugurating the C.W.G. plant. With him are Mr. H. Bradley, Beckton Station Engineer (centre) and Mr. Michael Milne-Watson (Chairman of the North Thames Gas Board).

These new workshops take the place of old, obsolete and scattered units which have been inadequate for the growing needs of the works, and on a floor space of about 80,000 sq. ft. most of the 400 men engaged in maintaining the chemical process plants will be accommodated, together with engineering stores.

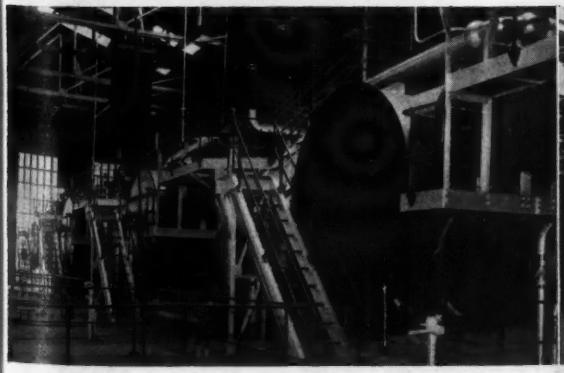
The building, carried on reinforced concrete piles, is in four main bays, three of which are fitted with overhead travelling cranes. The north light roofs are carried upon steel stanchions which rise from the floor and also support the beams for the overhead crane carriages. At the eastern end, a second floor has been constructed to accommodate the drawing office and the mechanical engineering staff.

A notable feature of the design is a generous assembly area readily accessible to all the crafts for building and repairing large units of plant. Materials received by road and rail will pass smoothly through a checking station into the workshops stores. The installation of all the machine tools and fittings is not yet complete, owing to delay in delivery, but equipment will be built up gradually during the next two years.

The building is light and airy and will be heated by warm air during winter. The colour scheme of primrose, pink and light blue gives the interior an appearance which relieves some of the monotony inherent in large mechanical workshops. Indeed, no description of any of the new extensions at Beckton would be complete without reference to what we may term this 'amenity factor.' The same lightness and airiness is a feature of all the other buildings, introduced by large areas of glass extending vertically up the outside walls. Similar colour schemes are incorporated in the plant to counteract the drabness which is otherwise unavoidable in most industrial installations.

The Inauguration

Mr. MICHAEL MILNE-WATSON (Chairman of the North Thames Gas Board), in inviting Colonel Harold Smith, Chairman of the Gas Council, to inaugurate the new plants, said that Beckton owed



The Four Waste-Heat Boilers

A View of the New Workshops

its existence to the long-sighted planning of Simon Adams Beck and his lieutenants in 1866. At that time all this land was marshy grazing ground and the industrial development was an unhappy time for the cows ruminating here as it was claimed—quite unjustifiably of course—that they were poisoned by the effluent coming from the gasworks. More successful was the claim for compensation by a reed-cutter who used to harvest thatching reeds in this area. It was interesting to recall that the original works cost some £600,000, while today Colonel Smith would be inaugurating three installations of plant valued at some £2 mill. There was a very interesting connection between the plant around which they were now standing and the early days at Beckton, because Humphreys and Glasgow who built the plant they were opening that day, designed the first C.W.G. plant to be erected in England, which was erected at Beckton in 1891. There was still on the original site a C.W.G. plant capable of over 40 mill. cu.ft. per day. He paid tribute to the work of the contractors who had been involved in these three projects. Particularly would he thank the following for all the work they had done: Humphreys and Glasgow, Peter Lind, W. H. Allen, Babcock and Wilcox, A. Roberts and Company, Aston Construction, Ltd., Thomas and Edge, Sir Robert MacAlpine and Sons. Much of the work, he added, bore the hall-mark of their own engineers, chemical engineers and drawing office staff, who must today feel justly proud of the outcome of their work. They also acknowledged with appreciation the work done in their respective spheres by their consulting engineers, Mackness and Shipley and Brian Colquhoun and Partners.

Colonel H. C. SMITH said it gave him great pleasure to be invited to perform the opening ceremony of the new plant. Simon Adams Beck was a man of great vision, but he wondered if he or any of his colleagues could possibly have visualised the effect which would result in the year 1952 of his driving in the first pile of the river wall nearly 100 years ago.

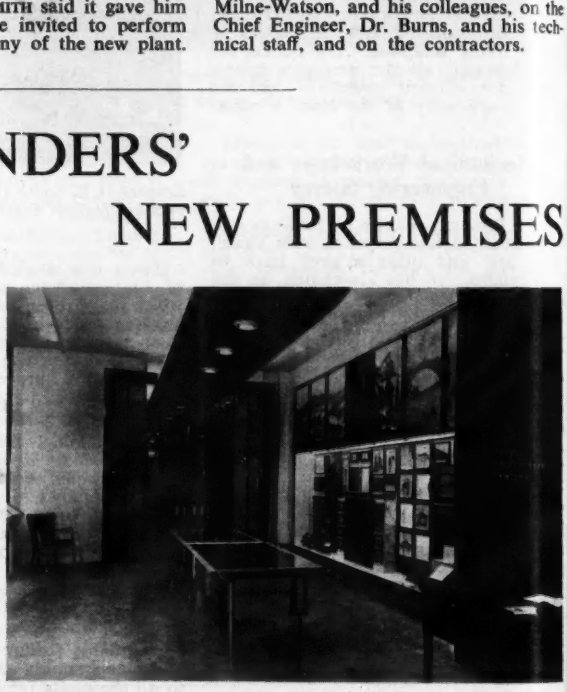
Reconstruction and improvement never stopped at Beckton. Larger and more efficient plants and apparatus of various types were continually being built or installed to replace those older and less efficient and to meet the growing demands for gas from domestic and industrial consumers. The construction of these new plants at a time of serious materials shortages occasioned by imperative demands elsewhere reflected the greatest credit on the Chairman of the North Thames Gas Board, Mr. Michael Milne-Watson, and his colleagues, on the Chief Engineer, Dr. Burns, and his technical staff, and on the contractors.

ALLIED IRONFOUNDERS' NEW PREMISES

ALLIED IRONFOUNDERS, LTD., an alliance of 22 companies, have assembled at 28, Brook Street, London, a permanent exhibition of the many space heating, water heating, and cooking appliances and other domestic equipment which they manufacture. These new and attractive showrooms were officially opened on Thursday last by the Minister of Works, Mr. David Eccles, who paid tribute to the firm's vision and enterprise. He pointed out that the emphasis had inevitably shifted from production to selling; hence the very real need for showrooms such as those at 28, Brook Street.

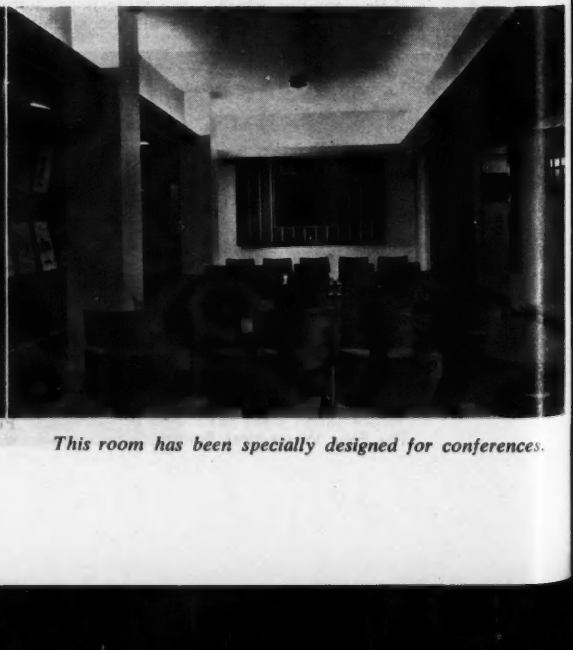
This new permanent exhibition is an important contribution to the nation's knowledge of space heating, water heating and cooking. Planned to be of special interest to architects, builders' merchants, officials of housing authorities and local councillors, and students of building and architecture, the latest products of the modern foundry are displayed in varied and interesting settings. Here, under one roof, can be seen an unusually wide range of low cost appliances, designed to reduce capital building costs to the minimum and, in the case of heating and cooking appliances, to bring down the housewives' fuel bills.

From all over Britain, from London and the Home Counties, from Manchester and the industrial Midlands, from Scotland and the north of England this equipment has been assembled as a worth while contribution to the new housing drive and will be of permanent assistance to all those who are striving to build modern labour-saving homes at an economic cost.



A view of the entrance hall showing the striking display panel on the right.

Display of gas appliances in the new showrooms.



This room has been specially designed for conferences.

LEEDS BRIGHTER HOMES EXHIBITION

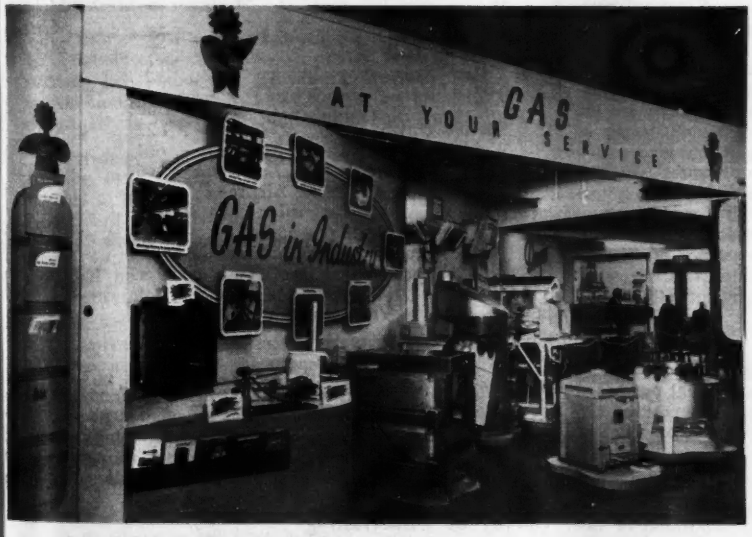
THE North Eastern Gas Board had a stand at the recent Brighter Homes Exhibition in Leeds. The stand was designed by the Board's Publicity Department and erected by Leeds group, and, as can be seen, adhered to the contemporary style which is being adopted by the Board with the express intention of countering the tendency to think of gas as old-fashioned.

The theme chosen was 'You Economise as You Modernise with Gas.' The layout was divided into four sections—cooking, space heating, hot water and home laundry, together with a combination of photographs in a shadow box supported by a recorded informal talk relayed through a magnetic tape recorder, putting over attractive features of the layout was the assymmetrical design, which provided that element of surprise that is considered by no less an authority than James Gardner to be one of the essentials of exhibition design.

The Parkinson cooker in the centre was a fully animated exhibition model, the folding top, drop door, and self-ignited burners operating automatically. On the back wall, which is partly concealed in the photograph, gas fires were set into illuminated recesses against a pleasing background of contrasting Sanderson wallpapers. The general lighting was subdued, Tungsten lamps being used, together with modern buckram pleated shades and spot lights.

The stand created considerable interest and favourable comments were expressed. The exhibition as a whole, though fairly well attended confirmed the tendency of falling attendances and lack of spending.

SUSSEX INDUSTRIES EXHIBITION



OUR photograph is of the stand of the South Eastern Gas Board at the Sussex Industries Exhibition. Equipment shown on the stand included 'Segas' No. 1797A pottery kiln, 'Controlled Flame' No. 4S. steam boiler, 'Segas' No. 1500A muffle furnace, De La Rue infra-red experimental oven, De La Rue 'Rex' 1/2 boiler, 'Segas' sugar boiler, 'Segas' tinman's stove, 'Segas' shampoo solution heater.

On one side of the rear wall was a large ellipse surrounded by a series of photographs depicting a variety of industrial gas installations. Mounted on the back wall were a Bratt Colbran luminous panel heater, and a De La Rue 'Stylised' radiant heater. Another feature was a 'live' surface combustion model of Mr. Therm by Radiant Heating, Ltd., and there was also a demonstration of an industrial thermostat and control valve.

A further photographic feature was a series of pictures of bakeries. The exhibit was designed and planned by the Sussex Divisional Publicity Section, in conjunction with Mr. A. E. Butcher, Special Service Officer, Sussex Division.

B.I.F. Charges Cut

THE Government are anxious that in Coronation Year the British Industries Fair should be fully representative of the commercial vitality of the country and that overseas visitors should be given a comprehensive view of the wide range of goods which British industry can supply.

It has been represented to the Board of Trade that this object would be helped if something could be done to reduce the cost of exhibiting at the Fair. The Board has gone into the matter carefully, bearing in mind its duty to prevent the organisation of the Fair becoming a charge on public funds, and has decided to reduce the charge to exhibitors for shell stands at Olympia and Earls Court by approximately 9%. (This will be done by dropping the 4% added in 1952 to meet a wages award and by a reduction of 5% in the basic charge.) It is hoped that industry will take the fullest advantage of this reduction. To facilitate this the Board of Trade will continue to consider applications for space up to October 25, and the allocation of individual stands will be postponed until that date.

After 12 Months' Rigorous Tests at the Dunlop Research Centre in Manchester, flame-proof conveyor belting has been accepted by the National Coal Board for use in mines where fire risk is a serious hazard. The belting is the result of more than 10 years' research and development, interrupted by the war; it was practically ready in its present form at the time of the Cresswell disaster in 1950. There are three new types of belting each incorporating Dunlop's flame-resisting compound.

Developments in

THE USE OF LIQUEFIED PETROLEUM GASES

By E. M. EDWARDS, M.Inst.Gas E., M.I.Mech.E.,
Member, Wales Gas Board

From a paper presented at the Annual General Meeting of the Wales and Monmouthshire Section, Institution of Gas Engineers, Ruthin, September 17, 1952

THIS paper should be regarded as being of an interim nature. It gives some account of the work carried out by the Wales Gas Board on the utilisation of liquefied petroleum gases. While experience continues to be gained, it is considered that this interim information on a development new to the gas industry in Great Britain will be of interest to the members of the Wales and Monmouthshire Section, and it may also be helpful to colleagues in other parts of the country.

Following on an examination that we were able to make in October, 1950, through the courtesy and great assistance of officials of Gaz de France, when we had the opportunity of examining the processes that were being developed for the utilisation of liquefied petroleum gases by the gas industry in France, we concluded that, with certain reservations, there was a field for the development of the use of such gases by the gas industry in Great Britain.

The introduction of butane-air supplies involves the development of a new technique to deal with gas heavier than air and of a nature quite different from that to which we are accustomed. Points for consideration include:—

Plant safety, especially the fire hazard; internal corrosion of metals, including holders, mains, services and meters; meter diaphragms and stuffing boxes; yarn or jute of main joints; lubricants for main taps, cocks and valves; internal carcassing pipes; unaccounted-for gas; the modification of existing appliances, and the design and availability of new appliances; combustion characteristics; the addition of odorants, to ensure the supply of gas of a distinctive odour; the possible danger of gases of high specific gravity accumulating in low places such as cellars, drains and culverts; distribution pressures required; possibility of condensation of LP-gas in the distribution system in cold weather; the operation of LP-gas/air systems without gasholders; the design of fully automatic stations; the development of new types of leakage indicators; constancy of calorific value; security of supply; precautions against static electrical potential. The list indicates some—though not all—of the points that have been examined.

It was decided to treat the Whitland undertaking as an experimental station, and to install one plant imported from France through British manufacturers, and one plant purchased direct from America. Each plant is capable of producing the same type of gas-air mixture, but they are designed on different principles.

Choice of Calorific Value

Considerable thought was given to the composition of the mixture to be distributed. Among others the following factors were considered:—

(i) The calorific value and specific gravity of the mixture should be such that the loss from the distribution system should not greatly exceed the loss with coal gas.

(ii) The combustion characteristics should be such that the maximum number of existing appliances could be adapted—*i.e.*, the Wobbe index of the mixture should be reasonably near that of the coal gas previously distributed.

(iii) The thermal transmission capacity of the mains and services should not be reduced and should preferably be increased.

(iv) The effect of high calorific values on the resetting of prepayment meter coin mechanisms.

These factors conflict and the most suitable mixture is obviously a compromise between them. The French practice is to distribute a mixture of propane and air with a calorific value of 720 B.Th.U. per cu.ft. The mixture finally chosen was 23% butane and 77% of air, having a calorific value of 730 B.Th.U. per cu.ft., and a specific gravity of 1.22. With this mixture the thermal delivery capacity of the mains system is increased by about 14%, and the thermal storage capacity of the gasholders by 66%.

The comparison between a typical sample of Whitland coal gas and a butane-air mixture of the composition finally selected is given below:—

	Butane/air	Whitland Coal Gas
C.V.—B.Th.U./cu.ft.	730	440
Gas Analysis:		
CO_2	—	3.7%
O_2	16.2%	2.5%
N_2	61.0%	26.2%
CmHn	—	2.5%
H_2	—	34.7%
CO	—	5.9%
CH_4	—	24.5%
C_4H_{10}	20.5%	
C_3H_8	2.3%	
C_5H_{12}	trace	
Specific gravity	1.22	0.595
Wobbe Index	664	568
A.T.B. Number	46	32
Theoretical Volume of Air required for combustion 1 Volume of	6.1	3.7
Total Volume of Wet Waste Gases per Volume of Gas Burnt	7.4*	4.5
Theoretical CO_2 content of dry waste gases	14.0%	11.6%

* On an equal thermal input basis this figure becomes 4.5.

Specific gravity determinations by means of gravity bell are in very close agreement with the calculated figures. The variations of specific gravity with calorific value are small and a sensitive recorder with an open scale is necessary. This gas can be distributed at normal coal gas distribution pressures.

Survey of Undertaking

To provide the information necessary to convert the undertaking to butane-air, a detailed survey was made at Whitland in February, 1951. It covered the following items:—

Holder and station meter details; system of mains; condition of mains; pressure survey; control of district pressures; inspection of works and district syphons; valves; specific gravity and calorific value tests; services; meters; main taps; consumers' appliances; street lighting; gas made and distributed; unaccounted-for gas; peak instant demand; potential loads; and electricity supplies.

The survey showed that:—

(i) The number of consumers was 226;

(ii) the mains system was adequate for the existing load;

(iii) there were 231 main taps fitted, 87.5% of which could not for various reasons be operated;

(iv) there were 145 prepayment and 86 ordinary meters;

(v) there were 202 gas cookers, 35% of which were more than 20 years old;

(vi) the remainder of the appliances were:—

Gas fires	6	
Wash boilers	19	
Boiling rings	18	
Poker burners ...	4	
Geysers	6	
Sink water heaters ...	4	
Radiators	6	
Griller hotplates ...	2	
Sunhot circulator ...	1	(not in use—later scrapped).
Overhead panel heaters	10	
Café boiler	1	
Fish frying range ...	1	
School canteen kitchen		List of appliances given later
Lighting burners ...	67	(excluding railway station).
Multipoint heater ...	1	(later scrapped).

(vii) Gas unaccounted for was 10.5%.

(viii) The instant peak demand was 3,000 cu.ft./hr.

(ix) The maximum daily gas sent out was 20,000 cu.ft.

Investigation of Mixtures

In May, 1950, an examination began of the information available on American and French practices in the distribution and use of butane-air and propane-air mixtures. A butane-air test bench was equipped and experiments made into the use of butane-air mixtures of varying proportions.

In October, 1950, certain appliance manufacturers were asked to collaborate in the work by producing appliances suitable for use with butane-air. This work provided much valuable information on the nature and extent of the problems involved, particularly in respect of a limited number of appliances.

Following the detailed survey of February, 1951, and the decision in May, 1951, to install a butane-air plant, it was decided to ask the Watson House Centre of the North Thames Gas Board to undertake an investigation, the terms of reference of which were:—

(a) To investigate the effect of butane-air on meters and governor diaphragms;

(b) to investigate the performance of appliances using butane-air and to make recommendations with regard to necessary modifications;

(c) to examine the performance of aerated and 'non-aerated' burners designed for use with butane-air;

(d) to advise on the adjustment of appliances on the district and to suggest any desirable equipment for the purpose;

(e) to advise on jointing materials for pipe lines;

(f) to advise on oil films in water-sealed gasholders;

(g) to investigate the inflammability limits of the proposed mixture in relation to the explosion hazard at the time of changeover from town gas.

This work was, in October, 1951, expanded into a full scale investigation into the use of butane-air. This investigation continues. It is not proposed to give as part of this paper details of the result of the work carried out by the chemists of the Wales Gas Board and by Watson House. It will, however, be clear from later sections of this paper that the investigations resulted in a very successful changeover of appliances at Whitland. The work also indicated further long term objectives for investigation.

Conversion of Distribution System and Appliances

As a result of information obtained from technical reports from America and France, from a visit to France, from investigations carried out in Wales and at Watson House, and from information obtained from meter, governor, appliance, and other manufacturers, the following arrangements for the conversion of the Whitland undertaking were formulated:—

Butane-air as produced is only partially saturated with water vapour since the liquid butane is dry and the air normally unsaturated. Owing to the high percentage of oxygen (about 16%) in the mixture, it is desirable at least to maintain the mixture in its already partially dehydrated state to minimise corrosion in mains, meters, etc. It was therefore decided to oil film the gasholders.

It is the practice in France to fog the mixture with benzole and/or gas oil, and arrangements were made for this to be done at Whitland.

There is some evidence from America of leakage from mains due to the drying out of the yarn in lead/yarn joints, and this has been successfully overcome there by spraying the mains internally with a proprietary liquid, 'Carboseal.' A quantity of 'Carboseal' sufficient to treat the mains system at Whitland has been imported, and will be held in stock in case drying-out of joints is experienced. 'Carboseal' is expensive. The cost of the 120 gal. necessary to treat the Whitland mains was £178 delivered to Whitland. On the other hand, in France the fogging of the mixture with benzole and/or gas oil is claimed to be effective in preventing the drying out of yarn in joints.

It was felt that experience must be gained of the effect of the use of butane-air mixtures on existing distribution systems and it was decided that, in the initial stages at least, no treatment of the mains should be undertaken beyond ensuring that the system was reasonably sound.

Work on services constituted an examination of all sections of the services visible. Where possible those sections under floor boards were wrapped with Denso. Only one meter was found to be fitted in a cellar and the service was relaid and the meter fitted on the ground floor level outside the building. Where necessary services were cleaned internally, repaired, or renewed.

Some 111 new ¾-in. main cocks were fitted and 10 ¼-in. Saunders valves. Three of the Saunders valves were fitted with 'H' diaphragms and seven with 'T' diaphragms.

The new and existing main cocks were re-lubricated using for some cocks Barbatia No. 4 grease (formerly F.D.7) and for others S.3200 grease. The Barbatia No. 4 grease has been widely used in France, but there is some evidence that the graphite in this grease tends to score the lubricated surfaces. The S.3200 grease is experimental and has only been issued to Whitland for field test. The normal lubricants used for coal gas tend to be affected by LP-gas.

Meters

It seemed probable that the butane-air mixture would have the effect of washing away the lighter constituents of standard meter diaphragm dressings and so reducing the pliability of the leather. It was, however, reported from France that no difficulty had been experienced with normal dressings provided the meter had not previously been used to measure coal gas.

It was decided to install meters at Whitland with different types of diaphragm treatment, to install a number of new normal meters, and to leave in use a proportion of the existing meters. This programme was designed to give as much information as possible of the effect of butane-air on the meters, including diaphragms and stuffing boxes. Watson House were asked to undertake accelerated tests on typical special meters.

Meters with special diaphragm treatment were installed as follows:—

Maker	Type of Diaphragm Treatment	Number of Meters fitted: Prepayment	Ordinary
'A'	1. Oiled silk on governor leathers	3	—
	2. Oiled silk on normal meter leathers	3	—
	3. Normal leathers with vegetable oil and graphite dressing	3	—
	4. Normal leathers with vegetable oil dressing	3	—
'B'	Synthetic rubber diaphragms ...	6	—
'C'	Synthetic rubber diaphragms ...	10	6
'D'	Normal leathers with castor oil dressing	—	6
'E'	Normal leathers treated with a dressing consisting of: Shell Nasa oil J.85—3 gal. ... Tallow 32 lb.... Duckham B.60 grease 8 lb. ... Graphite 2 lb. ...	12	6
'F'	1. Normal leathers treated with a dressing supplied by C. C. Wakefield, Ltd., designated 'Product 8460'	6	6
	2. Synthetic rubber diaphragms	4	5
'G'	Normal leathers with castor oil dressing. Gear boxes and stuffing boxes filled with Wakefield's heavy gas tap grease	12	6
		62	35

All these meters were 100 ft. D.1 meters.

Of the original meters, 19 ordinary and 29 prepayment meters were re-fitted after testing. The remainder of the meters fitted were now 100 ft. D.1 meters with normal diaphragm dressings and stuffing box greases. Five 200 ft. ordinary die cast meters have also been fitted.

The meters fitted may be summarised as follows:—

	Prepayment	Ordinary
Meters with special diaphragm treatment	62	35
Meters originally fitted, tested and re-fitted	29	19
New meters with normal diaphragms ...	57	24
Die cast meters	—	5
	148	83

Total number of meters renewed or re-fitted—231.

Carcassing

The carcass in each house or premises was pressure tested with a water gauge. This was done in many cases while checking soundness of repairs or when testing governors, etc. The necessary repairs and renewals were carried out.

All appliance cocks and taps were re-lubricated using the greases detailed in the paragraph referring to main cocks.

Total number of taps re-lubricated ...	... 1,290
Average number of taps per consumer	... 5.5
Average time for re-lubrication per tap	... 10 mins.

Governors were fitted to all cookers not already incorporating a governor and to all wash boilers.

The governors used were: Cookers, 164 ½-in. B. governors; wash boilers, 36 ½-in. I. governors; sundry appliances, 10 ½-in. I. governors.

These governors were fitted with normal leather diaphragms dressed with five different special dressings. Details of the special dressings and the numbers of each are as follows:

		Number Fitted.
No. 1 dressing.	50. C.C. Shell Carnea 27 oil and 22½ grams Shell Otima B. grease	26
No. 2 dressing.	65. C.C. Shell Carnea 31 oil and 30 C.C. neats foot oil and 5. C.C. cod oil	41
No. 3 dressing.	50. C.C. Shell Nasu J.85 oil and 53 grams tallow and 13.3 grams Duckham B.60 grease and 3.3 grams graphite ...	32
No. 4 dressing.	Castor oil	47
No. 5. dressing.	Valoata oil B.C.12	52
In addition to these 42 existing governors were left in use on existing appliances		42
Total number of governors in use		240

Conversion of Appliances

Preliminary work showed that the burner port area on cookers required increasing by 70-100% to obtain an equivalent thermal output using butane-air as compared with coal gas.

In September, 1951, a typical older type cooker was sent to Watson House. When the burner ports of this cooker were enlarged by a No. 19 Morse drill and the airport covered to leave a hole of about ¼ in. diameter, the burners were quite satisfactory and gave approximately the same thermal output. These results indicated a burner port area increase of about 80% and that the airport should not exceed ¼ in. diameter. It was thought that these dimensions would hold good for most types of cookers with drilled burners.

The possibility of using a Rotameter to measure the gas rate at the injector was explored and arrangements made for four Rotameters to be calibrated for a butane-air mixture of 1.25 S.G.

It would be impossible to re-drill burners and to adjust them all on the day of the change-over from coal gas to butane-air. Since it was not possible to use the butane-air mixture on existing cooker burners without re-adjustment of the injectors, alterations to the air adjustment, and re-drilling of burners, it was necessary to arrange for the conversion to be in two stages. It was found to be possible to adjust the injectors for the required flow of butane-air, re-drill the burners, and to adjust aeration to give reasonable results both on coal gas and on butane-air. On this basis, it would be possible to visit all consumers on the day of the change-over and make the final aeration adjustment.

The size of the airport was found to be extremely critical and the following conversion procedure was planned:

(i) The burner to be adjusted to give maximum efficiency using coal gas.

(ii) The burner removed and the coal gas rate of flow through the injector measured with a test meter.

(iii) Using a Rotameter the injector to be adjusted to give a flow of butane-air with an equivalent thermal content.

(iv) The burner ports drilled out to 19 Morse and, where other means of aeration adjustments were not available, the air-clip drilled to given an airport size rather less than the area considered to be the maximum required for use with butane-air.

During the conversion period and before the supply of butane-air commenced, the burners would, with coal gas, give a rather loose and a slightly luminous flame with reduced thermal output. When butane-air was supplied, the flames would still be rather 'soft' but maximum efficiency would easily be obtained by a slight increase in airport area. Consequently 'lighting back' and 'flame lifting' during the actual change-over of gases would be minimised.

This reduction in thermal output during the period of conversion made it imperative for the conversion period to

be as short as possible. It was, therefore, decided to complete all other work on the district before the drilling of cooker burners was commenced.

In October, three cookers were converted on these lines and taken to Cardiff for test on butane-air. When these were tested a slight adjustment of the air-shutter was all that was necessary to obtain good combustion. It was, however, found that the distance between ports was too great for the flames to light spontaneously from any one point. Further work on this was undertaken by Watson House.

As a result of this further investigation, it was decided to endeavour to drill wherever possible, a single ring of small ports closely spaced and using a 34 Morse drill. An inner ring of ports was to be avoided due to starvation of secondary air. The total port area could be found by allowing one square inch of port area for 18,000 B.Th.U. output.

It was decided that all cookers should be fitted with a governor as it was found that the best results were obtained with a pressure of 2.5 in. W.G.

Work on the conversion of cookers commenced on January 1, 1952. Four fitters were employed and three weeks were available for the work to be completed.

Burner Drilling

The conversion procedure was carried out in accordance with the arrangements described, using test meters and Rotameters to obtain the correct injector setting. Having re-adjusted each cooker burner to maximum efficiency on coal gas and obtained the coal gas consumption by means of the test meter, the rate of flow of coal gas was multiplied by 0.617 to obtain the equivalent thermal flow of butane-air. (Tables for this were provided). The injectors were then re-adjusted to this rate of flow using a Rotameter calibrated for the butane-air mixture of 1.25 S.G. This procedure was quite satisfactory, but it was found to be difficult to drill existing burners with additional ports of 34 Morse size. To drill one set of cooker burners in this manner took three hours. It was, therefore, decided to return to the original plan of enlarging existing burner ports to 19 Morse size.

Three fitters were engaged in re-setting injectors and air ports and one fitter remained at the works drilling the sets of cooker burners and also drilling the air clips with a $\frac{5}{16}$ in. diameter hole.

When the injectors of each cooker had been re-adjusted the burners were returned to the works for drilling, and the fitter proceeded to the next consumer. When delivering this next set of burners to the works for drilling, the previous set of burners, having been drilled, was collected and re-fitted. In this manner the time during which consumers were unable to use their cookers was reduced to a minimum.

A record of Rotameter settings was kept so that when similar cookers were found, the first part of the procedure was not necessary. Cookers with fixed injectors were not so easily converted. With one series of cookers it was possible to change the injectors for others of suitable size. In other cases, the injectors were removed, sealed over and re-drilled. A number of new cookers specially modified for use with butane-air were sold to consumers. No 'Ace' type burners were found in Whitland. The port areas of cap type serrated burners were increased successfully by inserting washers to lift the caps.

School Canteen

The school canteen is designed to prepare 300 school dinners each day. The equipment installed is: One double oven range, two steamers, one hot closet, one single oven, two boiling pans, and one N.O.W. pattern heated sink. The double oven range was converted using the procedure already described for cookers.

For the steamers the makers supplied and fitted new burner assemblies using suitable butane-air burners. For the hot closet the makers supplied a new burner assembly.

The oven and one boiling pan worked satisfactorily on butane-air after adjustment. A set of new boiling rings was fitted in the other boiling pan.

The heated sink was converted with suitable size Bray burners. This unit had not previously worked satisfactorily on coal gas, but is now entirely satisfactory.

Water Heaters and Other Apparatus

All water heaters were replaced with suitable models of the range of special water heaters developed by appliance makers. This was necessary since suitable conversion burners for the existing water heaters were not then available.

Preliminary investigations indicated possible difficulties in converting some gas fires and radiators, and these were replaced by suitable apparatus which had been developed for use with butane-air.

By January 22, the day of the change-over, the following range of appliances was available for use with butane-air: One bath geyser, one instantaneous sink water heater, one circulator, one quick recovery storage heater, two café boilers, four portable fires, four fires and two radiators. All of these operate with reasonable satisfaction on coal gas as well as on butane-air with suitable adjustment.

There was one installation of wedge pattern overhead panel heaters in a school dining room. Previous work had shown that this model does not lend itself to conversion and the installation was replaced with bowl pattern heaters. A set of luminous panel heaters had been ordered but not installed and arrangements were made for these to be modified and supplied suitable for use with butane-air.

The makers designed and fitted a new burner assembly for a café water boiler.

A two pan fish range was satisfactorily converted after experimental work at the Board's Cardiff laboratory.

Wash Boilers

Investigations suggested that the burner ports of wash boilers should be enlarged to 29 Morse and a hole of about $\frac{1}{4}$ in. diameter drilled in the air-clip, and that the method of conversion would be the same as for cooker burners.

The suggested method of enlarging burner ports to 29 Morse drill size and drilling a hole of $\frac{1}{4}$ in. diameter in the air clip did not prove to be satisfactory on the wash boilers fitted at Whitland. Satisfactory results were obtained by enlarging the outer ring of ports to 29 Morse, sealing off the inner ring of ports and leaving the air-shutter in the full-open position. The injector was adjusted to a Rotametor reading of 25 since all the burners were of the standard 40 cu.ft. per hour (coal gas) pattern. A governor set at 2.5 in. W.G. was fitted to each wash boiler.

It was found that lighting burners could be fully converted by re-adjustment of the variable injectors and existing air ports.

The following jointing compounds were used in carrying out the work described: (1) Hermatite jointing compound, (2) caulker compound, (3) anti-size jointing compound. No failures of jointing material have yet been traced.

Leak Detection

The available leakage indicators, based on the principle of osmotic pressure, are not suitable for use with butane-air. The American practice is to use an instrument called the 'M. & A. Explosimeter.' A similar instrument, the 'Poole Explosimeter' is available in this country and one was ordered for trial at Whitland.

The basic thought behind the plans for district conversion was that all gas apparatus should be available for use throughout the conversion and change-over periods and that the

maximum amount of information on the effect of butane-air on the widest range of reputedly suitable materials should be obtained.

The Change-Over

At 8.15 a.m. on January 22, 1952, the valves of the gasholder containing butane-air were opened and butane-air supplied to the district.

A team of five gas fitters then commenced a house-to-house visit to make final aeration adjustments to appliances, to re-set prepayment meters, and to read and record the state of index of all ordinary meters. With the exception of a few who were away, all consumers were visited on that day. No difficulty was experienced. A few consumers commented that the 'new gas was dirty.' This was due to the under-aerated flame resulting from the intermediate stage of adjustment already described and this was rectified as soon as each house was visited.

The school canteen was able to prepare the usual 300 mid-day dinners and the fish-fryer was able to use his range for the normal requirements.

The fitters also re-adjusted all lighting burners during the daylight hours and the evening railway station lighting was noticeable for its brilliance.

A number of fires and radiators which had been replaced were examined in the test room at the works and it was found that several could be satisfactorily adjusted for use with butane-air. One gas fire was re-adjusted and re-fitted on the district and similarly a radiator fitted with governor burners was found to be quite satisfactory. Two panel fires fitted in a house were satisfactorily re-adjusted. This was not found to be possible, however, with all types of fires and radiators.

It was also found that the hotplate burners on one of the cookers specially modified for butane-air could be fitted on the standard coal gas model by exchanging one stretcher bar. Sets of burners have been supplied to several consumers who were using this type of cooker.

Butane Plant

The new installation at the Whitland works consists of a storage shed, capable of taking ten butane containers, with loading and unloading equipment; a new building to house a positive twin blower 'Mallet' mixing plant; a self contained inspirator type 'Gasair' mixing unit; a No. 40 B.M. meter on outlet holder; and a calorimeter room.

The preliminary investigation of the supply of butane-air mixtures was based on the supply of butane by means of portable containers in order to secure flexibility of operation combined with minimum capital cost.

The butane containers in use at Whitland, imported from France, are dish-ended cylindrical vessels, having the following dimensions:—

Overall length 6 ft. 10 in.
Diameter 4 ft. 3 in.
Stamped weight 1,100 Kgms = 2,425 lb.
Stamped internal volume 2,330 litres = 81.9 cu.ft.
Butane charge 82% stamped volume at 0.58 Spr. Gr. 2,468 lb.

On one side of the cylindrical section of each container four feet have been arranged to facilitate transport in a horizontal position. Four brackets have been fixed on the other side to which lifting tackle may be attached. A skirt plate has been fixed around one of the dished ends to enable the containers to be stood in a vertical position on a small travelling bogie.

At both ends of the containers is an internal valve surrounded by a protecting boss. This boss is screwed inside to take a plug during the transport of the containers to and from the oil refinery and to take the connections to the mixing units when the containers are in use.

When the cylinders are in position for connecting to the mixing units, the plug used during transport is removed and replaced by a combined elbow and valve spindle which is used to open or close the internal valve. The elbow is connected to an excess flow valve, a $\frac{1}{4}$ in. copper coil, filter, valve and a $\frac{3}{4}$ in. steel pipe which is teed into the manifold supplying the mixing unit with butane liquid or vapour as the case may be.

Arrangements for Filling

Prior to use, all containers were examined and hydraulically tested to a pressure of 200 p.s.i. by the Board's insurers, who accepted the vessels for a working pressure of 90 p.s.i. The hydraulic test was carried out by means of paraffin and a check of the internal volume was made at the same time.

After removal of paraffin the containers were twice evacuated to — 28 in. w.g. and each time released to atmospheric pressure prior to filling with commercial butane under pressure through the valve at one end.

As a precaution against an abnormal increase in pressure, due to expansion and increased evaporation of liquid contents by temperature rise in a vessel in which sufficient expansion space has not been left, a filling ratio of 82% is being observed, that is to say the maximum amount of liquid that is being filled into each container is regulated to 82% of the total capacity of the vessel.

Filling is carried out, with the container in a horizontal position on a weighbridge, until the correct weight is reached. The time taken varies from 20 minutes upwards per container.

Once the containers have received their initial filling of butane it is found that a small quantity of liquid remains in them when they are returned for refilling. Containers so returned are refilled without further evacuation, the amount of butane introduced being the quantity required to bring the contents up to the specified weight.

Transport and Handling

The containers are carried between Llandarcy oil refinery and Whitland gasworks, a distance of about 50 miles, in the horizontal position on ordinary lorries. Normally a 7 ton lorry is used to secure the economy that results from handling two containers at once. At Llandarcy the containers are handled throughout the unloading, refilling, and loading operations in a horizontal position.

At Whitland the containers are unloaded in a horizontal position on to the floor of the unloading bay. The lifting gear is then attached to the two eyes and the two lugs at one end of the container and used to tip the container into a vertical position and finally to lift it on to a small bogie which runs on rails provided in the storage shed.

This operation can be carried out quite readily by two men, the lorry driver usually assisting the local works attendant.

The storage shed and mixing plant building are combined units based on a simple steel frame structure erected on a concrete floor, 55 ft. 3 in. long by 21 ft. 3 in. wide. Part of the structure is brick panelled on all four sides and roofed over to form the mixing plant house. The remaining portion forms the butane container storage shed and unloading bay.

Storage Shed

The storage shed consists of a concrete floor, 21 ft. 3 in. by 38 ft. 9 in. long, a length of 22 ft. 6 in. adjacent to the mixing plant building being covered by a continuation of the mixing plant asbestos sheeted roof. This covered section is arranged to take two parallel banks of three containers each. The uncovered section is arranged to take four spare con-

tainers. The whole section is spanned lengthwise by a 12 in. by 5 in. runway joist carrying a 3 ton travelling chain block for lifting the containers from a lorry on to bogies which run on five sets of flat-bottomed rails set in the concrete at right angles to the overhead lifting beam. The chain block is also used for transferring containers from one bogie to another. Each set of rails can carry two bogies and therefore serve two container positions.

Each bank of three containers has top connections to one of two separate vapour manifolds serving the Mallet plant mixing unit. One bank of three containers also has bottom connections to a liquid butane manifold which serves the Mallet plant mixing unit through a vaporiser heated by hot water from a butane fired hot water circulator.

This liquid butane manifold also serves the Gasair mixing unit through a vaporiser incorporated in the Gasair plant, a vapour return pipe being connected to the vapour manifold.

Mixing Plant Building

The mixing plant building is a brick panelled steel framed room, measuring 18 ft. by 13 ft. by 17 ft. to eaves, covered by an asbestos sheeted roof. An unbroken gable end wall separates the room from the adjacent butane storage shed. The two side walls contain windows and top and bottom cast iron ventilators, particular attention being paid to the positioning of the ventilators at floor level since butane and butane-air mixtures are heavier than air.

One corner of the room is bricked up and roofed to form a sealed compartment 4 ft. square by 9 ft. high for the electricity control panel, fuse boxes and switches, etc. Access to this compartment is gained through a door on the outside of the building.

The remaining portion of the mixing plant room houses a complete twin blower Mallet plant consisting of butane vapour compensator, air and vapour washers, air blower, vapour blower, electric motor, gauge panel and the necessary valves and connections.

Prior to installing the butane-air plants, the coal gas make was measured by a No. 30 B.M. meter having a rated capacity of 3,000 cu.ft./hour. Since the new plants make intermittently at a possible rate of 5,000 cu.ft./hour, it was decided to replace the existing meter by a No. 40 B.M. having a capacity of 6,000 cu.ft./hour, and to install this in the holder outlet main.

A brick built calorimeter room, 12 ft. by 15 ft. by 10 ft. high to eaves, was provided to accommodate Boys calorimeter, bench and sink, two Sigma recording calorimeters on inlet and outlet of gasholder, specific gravity recorder, and other instruments.

Cubicle Heating

Pending the design and installation of a liquid butane vaporiser for supplying butane vapour to the Mallet plant from liquid butane drawn from the containers, the Mallet plant was originally connected to the vapour manifold of one bank of three containers only, these containers being temporarily housed in closed cubicles supplied with a current of warm air from a Radiation whole house heating unit incorporating a neat butane burner.

The heating unit was housed in a separate brick building some 10 ft. away from the main building. In severe weather conditions the neat butane vapour condensed in the supply line to the heating unit burner, although this supply line was laid for most of its length inside the warm air duct. This condensation added to the difficulties of maintaining cubicle temperatures. Following this experience, arrangements were made for a supply of propane, which liquefies at a lower temperature than butane, to be available for emergency use. It was found necessary to start the heating unit some two or three hours before starting the mixing unit in order to warm up the cubicles sufficiently to ensure a reasonable period of operation, an initial temperature of 70°F. in the cubicles being desirable.

The butane supplied to the heating unit was metered and was found to amount on a thermal basis to 4% of the butane-air mixture made.

It was found that it was necessary to have three containers at a time connected to the vapour manifold to avoid over-rapid cooling of the containers due to evaporation of the liquid butane. With two containers only in use the increased rate of evaporation per container caused a reduction of vapour pressure and an automatic plant shut down due to the compensator grounding.

Under extreme weather conditions, such as applied during the first week-end after the plant had been brought into commission, it was possible to maintain supplies by running the plant for about ten minutes every hour, leaving the heater on the cubicles continuously.

The container nearest to the mixing plant was found to discharge at a greater rate than the second container, and the second container at a greater rate than the container furthest from the mixing plant.

It was customary to shut down the air heater for the cubicles when gas making had ceased, and under existing atmospheric temperature conditions little or no transfer of liquid from one container to another appeared to take place.

The emptying of a container was normally indicated by the mixing plant shutting down automatically after a short period of operation, due to the compensator grounding.

No content gauges or indicators were fitted on the containers. It was found that a condensation line appeared on the containers in the cubicles when they were discharging, and it was assumed that this corresponded with the level of liquid butane in the containers. The containers were accordingly taken off the manifold for refilling when this condensation line reached the lower dished end of the container.

This indication of liquid level did not prove to be entirely accurate but it did enable the butane content of supposedly empty containers returned to the Oil Refinery for refilling to be kept between nil and 300 lb.

Liquid Butane Vaporiser

After the plant had been in operation for four months a hot water heated vaporiser for liquid butane was installed. The Mallet plant mixing unit was coupled to the vapour manifolds of two banks of containers as well as being connected through the vaporiser to the liquid manifold of one bank of containers.

It has been customary to draw liquid butane from only one container at a time when the vaporiser is in use and this procedure has enabled the containers to be almost completely emptied before being returned to the refinery.

Until the vaporiser has been worked under severe weather conditions it is not possible to give an estimate of the amount of butane that will be used for the hot water circulation.

Since the beginning of May it has been found that the heat stored in the butane containers at ordinary atmospheric temperatures has been sufficient to enable the mixing plant to operate for two to three hours at a time which is all that is required to meet Whitland's present daily demand. Air temperatures at 9 a.m. in the butane storage ground have been in the region of 58°F.

An initial approximate adjustment of calorific value was made by setting the relative speeds of the butane vapour blower and the air blower by means of the variable pulley on the air blower. No further adjustment of relative speeds has been necessary.

'Gasair' Unit

The designed capacity of the 'Gasair' unit is 5,000 cu.ft. per hour when operated with a butane vapour pressure of 22 p.s.i. at nozzle inlet.

Owing to the location of the 'Gasair' unit at some considerable distance away from the containers this pressure was not readily attainable and a nozzle of reduced diameter was fitted to enable the plant to produce a butane-air mixture of 700/750 B.Th.U. with an inlet nozzle pressure of 10 p.s.i. This had the effect of reducing the mixed gas production rate to 3,000 cu.ft. per hour.

This rate was recorded whether the container was full or nearly empty provided that the requisite nozzle pressure was maintained.

A vapour return pipe was laid from the mixing unit to the top connection of the container so that the container could be pressurised by the mixing unit vaporiser.

In this particular installation the distance of the unit from the containers coupled with seasonal weather conditions caused the vapour to condense to such an extent as to render this method of pressurising inoperable, but subsequent experimental work at a refinery has shown that the principle can be applied successfully.

Under extreme conditions of low atmospheric temperature it was necessary to pressurise the butane container with propane through the connection on the top of the container in order to achieve the desired nozzle pressure.

It was only necessary to couple one container at a time to the 'Gasair' unit manifold and the plant could be operated until the container ran empty.

No advantage was gained by using two or more containers at once as the liquid contents were found to level up so that all the containers in use became empty at the same time. There was no condensation line to give an indication of this level of the liquid butane in the container, but this was not of material importance since the mixing unit could be used to empty the containers.

Calorific value adjustment was effected by setting the nozzle pressure in accordance with the size of nozzle employed. It was at times found necessary to adjust the calorific value by means of the nozzle pressure when the unit was started up.

Since the inauguration of butane-air gas supply on January 21, 1952, the demand for gas in Whitland has steadily increased up to the present average weekly output of 554 therms which is an increase on a thermal basis of 19.7% compared with the corresponding period of the previous year, when coal gas of approximately 450 B.Th.U. was being distributed.

Highly Successful

At the time of writing this paper it can be stated with confidence that butane-air has proved to be highly successful for the consumers in Whitland. The quality and constancy of quality of gas supply has given great satisfaction and this is reflected in increased usage.

In all cases the service given by appliances is at least as good as with coal gas. The results do vary with the age and type of appliance and new specially designed appliances are obviously better than older models converted in the manner described.

The butane-air now being distributed is virtually sulphur-free, containing only 0.35 grains per 100 cu.ft. This should materially reduce maintenance on many appliances and enable a wider use of flueless heaters. The performance and condition of appliances is being carefully watched. There is now some evidence that the gas flowing through the mains is picking up old deposits such as naphthalene. No difficulty has so far been experienced with dust troubles but filters were fitted to the inlets of all meters for dealing with this problem if it should arise.

The Whitland experiment was undertaken to find out whether the idea of using butane-air as town gas in Wales is sound, what difficulties were likely to be encountered, and the effect of butane-air on gasholders, mains, services, meters, appliances and other equipment. Much has been done at Whitland with these ends in view that will not be necessary in another installation. The answers are, in some cases, already clear; in others they will not be known for some time.

During eight months working no difficulties have been experienced with the distribution and utilisation of the butane-air supply. Even although with some converted burners the aeration control may be more critical and, in a few instances, there may be a tendency towards slight flame tip luminosity, the indications are that the extent of district maintenance will be less than with coal gas.

It is hoped that further work now being done, particularly by appliance makers in developing replacement burner sets, will make much of what has now been done in Whitland unnecessary on any other installation. There will, however, in all undertakings be found a number of old appliances, particularly cookers, for which replacement burners cannot be obtained and the conversion of these on the lines described in this report can be undertaken with confidence and with the knowledge that the results obtained will be at least as good as with coal gas of the quality available in a small undertaking.

For fires and radiators, the Whitland experience would suggest that these need not, in many cases, be replaced. A stock of appliances suitable for use with butane-air should be available but need only be used if endeavours to re-adjust some of the existing appliances fail.

It is suggested that in undertakings where the introduction of butane-air is contemplated consideration should be given to selling only appliances which, while designed for butane-air, can be used satisfactorily with coal gas of the Whitland type.

The procedure described for conversion, particularly of cookers, could probably be modified in certain practical detail, especially in a bigger undertaking or one less compact than Whitland. One modification suggested is the calibration of the Rotameters with two scales, one for existing coal gas and one for butane-air. This would eliminate the need for the test meter when re-adjusting injectors.

Capital and Operating Costs

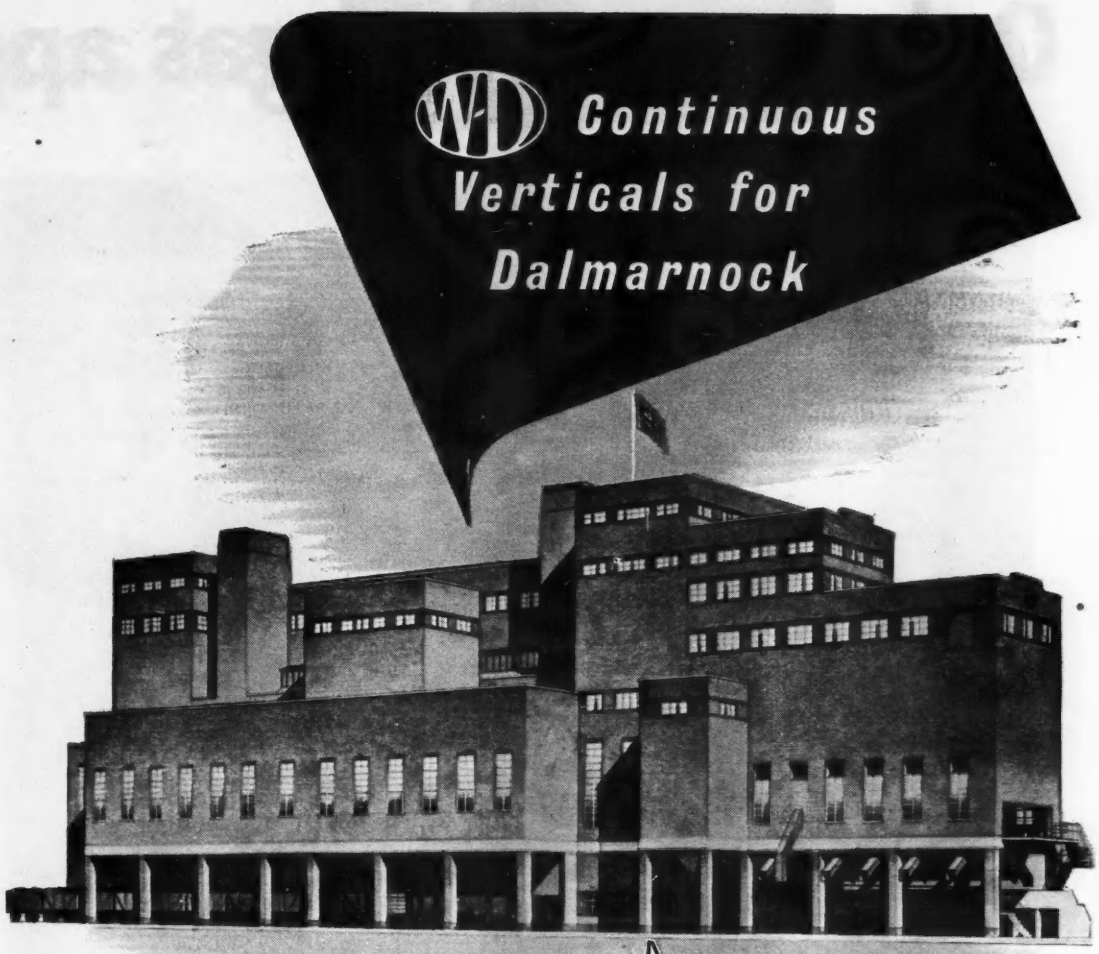
Costs of the Whitland experiment are not given in this paper, because Whitland was treated as a research station where two plants were installed and extensive experimental work carried out on the works and district.

Until terms for the long period supply of LP-gas have been settled with the oil refineries it would be unrealistic to give figures of estimated production and operating costs. Negotiations are proceeding, and the commercial success or otherwise of the process will principally be dependent upon the terms upon which the oil refineries are prepared to supply LP-gas to the gas industry.

As an indication of the estimated capital costs, as applied to an undertaking with an existing gas sale of 50,000 therms per annum, the following data are given:—

Number of consumers ...	750.
Gas sold per annum, including gas used by undertaking	50,000 therms.
Unaccounted-for gas	10%.
Butane-air gas, made into holder	55,555 therms.
Neat butane used on vaporiser	2% of butane bought.
Butane bought	56,688 therms.
At 480 therms per ton ..	118 tons.
Capacity of LP-gas/air plant when manufacturing 730 B.Th.U. gas	5,000 cu.ft., or 36.5 therms per hour.

(*Continued on p. 107.*)



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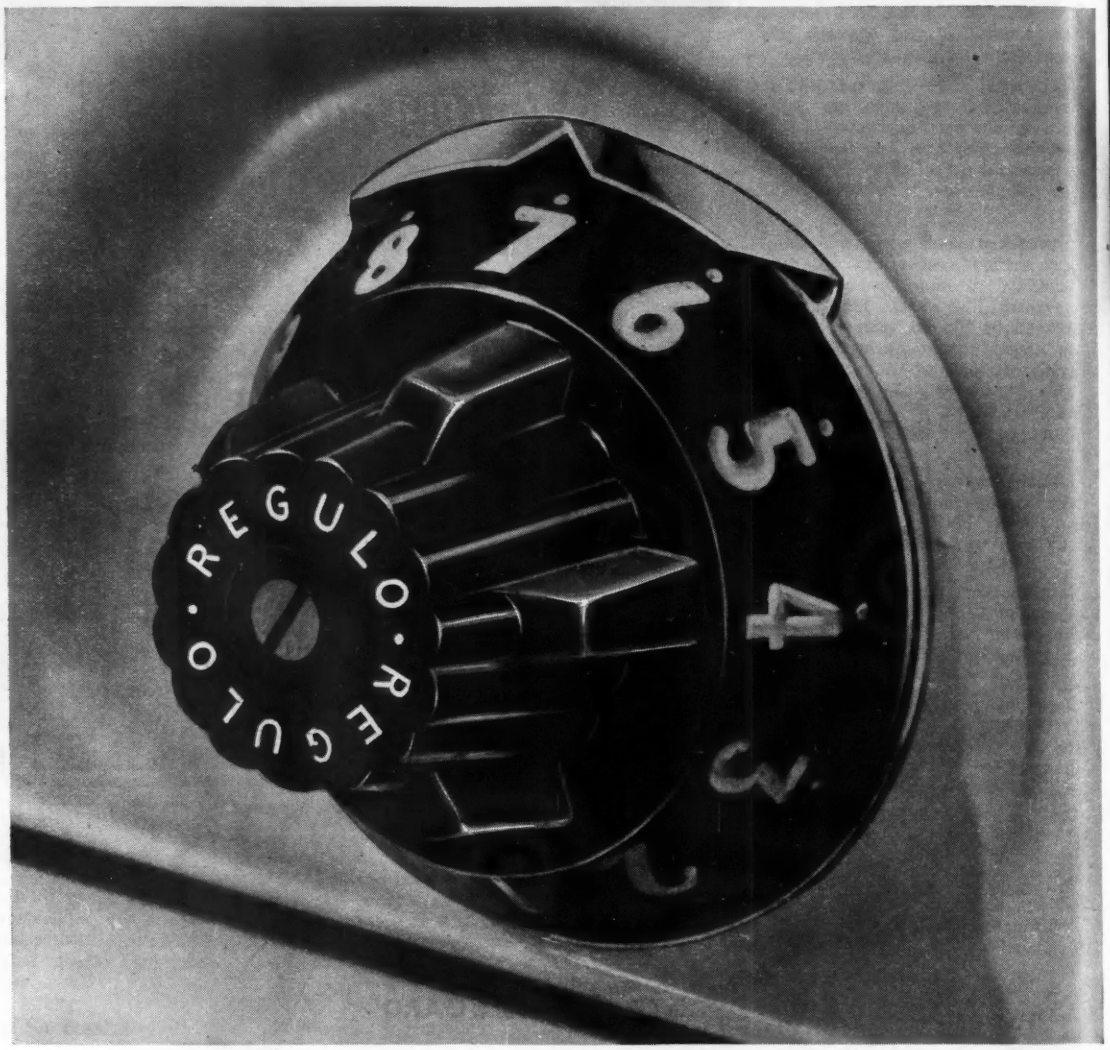

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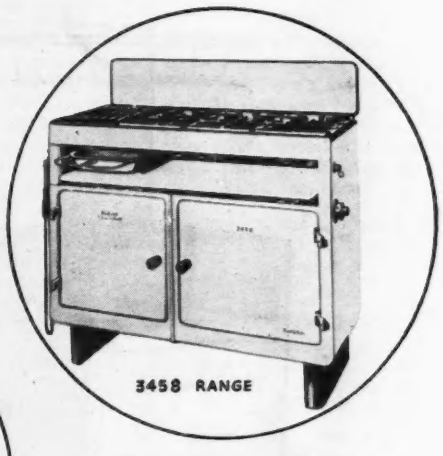

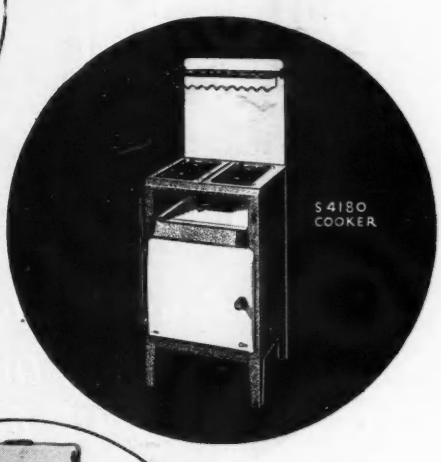

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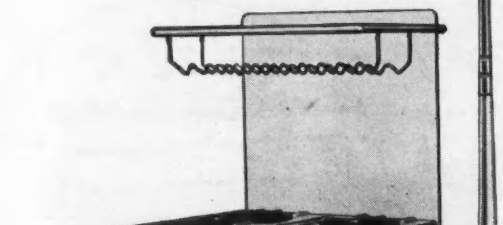

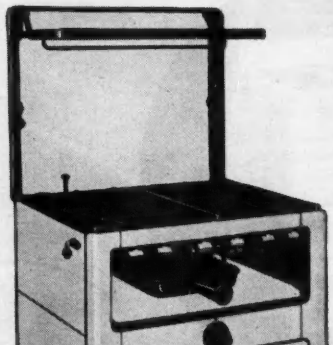

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Estimated Capital Costs

Item	Total sum and repayment period	Annual capital charges	d. per therm made	d. per therm sold
		£		
Mixing plant	£2,500—15 yrs.	228	0.99	1.09
Buildings	£500—30 yrs.	31	0.13	0.15
Storage tanks	£1,600—30 yrs.	98	0.42	0.47
Connection and sundries	£900—15 yrs.	82	0.35	0.39
Renewal of meters	£750—15 yrs.	68	0.29	0.33
Appliance conversion	£3,000—30 yrs.	184	0.79	0.88
Total Capital Expenditure	£9,250	691	2.97	3.31

The figures do not include any capital charges on existing plant and property, either on works or district.

In view of the high oxygen content of the butane-air gas, it is important to ensure that the gas will always remain above the dew-point, in order that corrosion of metals shall be minimised. Condensation in district mains and in holder outlet syphons has, on some occasions, been experienced, although no water has been found in the holder inlet syphons. Work is in progress to devise methods of maintaining the gas always above the dew-point. Even although gasholders may be oil filmed, regard must be had to the disturbance of oil filmed water surfaces caused by the movement through the liquid of the holder crown king-post and roof trussing. This especially applies to small gasholders.

The degree of air saturation varies with climatic conditions, and this is a variable for different countries, and for regions within a country. The use of surge tanks, which have no water seal, would be an answer to the problem in some cases. Partial drying of the air used may be necessary.

The process developed can be considered technically sound, and it enables a satisfactory supply of gas, of constant calorific value, to be provided to consumers.

The commercial success of the process and its development in Great Britain will be dependent, principally, upon propane or butane being supplied on acceptable commercial terms, with an assured security of long-term supplies. It will also be affected by the availability and cost of plants and equipment manufactured in this country.

Standard Code of Practice

If the use of LP-gas is to be developed by the gas industry in Great Britain, a standard code of practice should be prepared, covering the design, installation and operation of all equipment, and especial regard paid to fire and explosion hazards with transport and storage equipment. Plant safety is the first consideration in the design and operation of the installation. Suitable spacing of plants and storage containers, secure foundations, soundness of pipe connections—which should all be welded—provision for thermal expansion or contraction of pipe lines, design of safety valves and other fittings, avoidance of naked lights and smoking, earthing of storage tanks, spark-proof tools, suitable fire extinguishers, keeping site clear of grass, weeds or inflammable materials, and especially water sprays for keeping tanks and all equipment cool if a fire should occur, are most important factors that contribute to plant safety.

Static storage vessels are preferable to skid tanks or portable receivers. Where a number of works are operating this process, the use of static or stationary storage will result in a lower capital investment, less steel will be required, and the overall tonnage of liquid gas carried in stock will be reduced by comparison with skid tanks. In addition, stationary receivers are safer, and the use of bulk transport tanks would enable transport costs to be reduced.

When designing an installation a decision must be made as to whether the storage tanks and plant are to be constructed to take propane or butane. If there is any possibility that a plant originally intended for butane may later have to deal with propane, the installation must be designed to stand the heavier vapour pressure exerted by propane; this is vital.

The sizes of storage vessels should, as far as possible, be standardised, and installations should be designed so that additional vessels can be added, as required. Present experience suggests four weeks' average consumption as the minimum storage capacity.

Valuable information of the design of transport, storage installations and plant can be obtained from a study of the practices followed in other countries, which appear to have developed from the standards of the American National Board of Fire Underwriters. Suitable safety valves, excess flow valve, liquid level gauges, stop valves, pressure gauges, and thermometer pockets, are essential features; the fewer the connections and fittings to storage vessels, the better.

Care must be taken to avoid exceeding the permissible liquid level height in the receiver. The specified minimum vapour space—which will vary with the specific gravity of the LP-gas at 60°F.—must be maintained.

Storage vessels should not be placed inside buildings; they should be at least 50 ft. from buildings or future plants, and at least 5 ft. from one another. Bunding of tanks is advisable in some instances. Safety relief valves must be installed between each pair of shut-off valves on every liquid line.

When installations are being designed, consultation should take place with factory inspectors, electrical inspectors of factories, and with the Explosives Department of the Home Office, in order to ensure that the final installations shall meet their requirements and be in accordance with the best modern practice.

Ventilation and Odorant

Thorough ventilation of buildings housing LP-gas plant equipment must be provided, bearing in mind that the gas is heavier than air. Further research is required into the type and quantity of odorant used. When considering leakage from mains and services, it should be remembered that some soils have a deodorising effect on the gas. It is worth mentioning that as there is no carbon monoxide in the LP-gas, the risk of carbon monoxide poisoning arising from gas leakage is eliminated.

Since the gas-air mixture is heavier than air, it is an advantage when designing completely new installations to arrange for the new stations to be on high ground rather than on low ground; this is the reverse of the former general practice in the gas industry. It is of interest to note that with coal gas of a specific gravity of 0.45, an increase in level of 100 ft. results in an increased gas pressure at the higher point of 0.825 in. w.g. whereas with a liquefied petroleum gas-air mixture of a specific gravity of 1.22, there would be a decrease of 0.33 in. at the same point.

The increased calorific value of the LP-gas/air mixture at 730 B.Th.U., by comparison with manufactured gas of 450 B.Th.U., increases the thermal capacity of gasholder storage by 62%. This, coupled with the flexibility and rapid means of gas production, enables the ratio of volumetric gasholder storage to the maximum daily demand to be reduced. It is possible to operate a liquefied petroleum gas-air installation without a gasholder, using a surge tank. For this purpose, two plants should be used, one to come into commission automatically if the other cuts out.

General principles in building and plant design should incorporate:

(i) Fire-proof construction;

(ii) Ample ventilation of buildings housing plant, with especial provision for bottom ventilation by reason of the handling of gases heavier than air;

(iii) containers stored in the open;

(iv) large areas of glass windows for natural light;

(v) all electrical equipment in the plant room must be flameproof, so preferably should be the electrical control equipment in the separate section of the building.

For small gasworks it is an advantage for the station meter to be fixed on the outlet of holder, or, if no holder is used, at the outlet of the surge tank, even though the meter must be of sufficient capacity to meet peak instantaneous demand. Valuable information of the rate of send out at different periods of the day may be obtained by periodic checks upon the quantity of gas sent out, and especially between, say, 1.0 a.m. and 3.0 a.m., when little or no gas is used in rural communities, thereby affording a check upon the actual leakage of gas from the distribution system. My view is that in many instances the meter and station governor need not be housed—at the most, a suitable umbrella type of roof is all that is required.

Transport Costs

It is not possible to generalise on the relative transport costs of skid tanks, rail tanks, and road tanks; the economics of each individual case must be calculated separately, but in relation to grouped supplies to various undertakings. The comparison is not a simple one; available information is very limited, but the following indicates relative figures, which should be regarded with reserve:

Undertaking	Distance from producing centre—miles	*Cost per ton* Rail tankers	Road tankers	Demountable tanks
		£	£	£
A	45	3.50	1.40	3.10
B	70	3.89	2.18	3.94
C	60	3.97	1.87	3.62
D	28	2.68	0.87	2.33
E	35	2.84	1.09	1.68
F	75	4.18	2.32	4.22
G	45	3.02	1.40	2.97
H	45	3.47	1.40	3.14

The use of LP-gases can make a contribution to coal economy. One ton of LP-gas is approximately equivalent to 7.3 tons of coal used in hand charged horizontal retorts. The process is technically sound; it provides a supply of gas of very constant calorific value and composition—in fact, at least up to the high standard of modern large plants.

The comments made in this paper are necessarily circumscribed by the time factor, but I trust they will be found helpful to those who have similar problems to consider. The lessons learned and knowledge gained are being applied to the design of an installation for a second undertaking which is to be converted to butane-air. Experience continues to be gained, and at a later stage further information will be made available.

During the course of this work we have received very material assistance from Watson House, from the oil industry and associated firms, from the suppliers of the plants, and from the manufacturers of gas appliances, meters and other equipment, without whose co-operation the work could not have developed to the present stage.

The introduction, development, and operation of the process—even although as yet it has been applied only to a small undertaking—has been the co-operative work of officers and employees of the Wales Gas Board, to whom I am pleased to have the opportunity of expressing my personal appreciation.

DISCUSSION

Dr. A. Marsden, M.B.E., Area Scientist, South Western Gas Board, said it was becoming almost a hackneyed saying now to observe how much the gas industry was indebted to Mr. Edwards and his colleagues in the Wales Gas Board for their pioneer work in connection with the use of liquefied petroleum gases, but it was a fact, and he was pleased to emphasise it. There were others who were interested—his own Board among them—and no doubt some of the points they wished to clear up were those which as a result of experience Mr. Edwards might be able to answer. His own immediate interest was in the supply of L.P./air mixtures to small units or undertakings where integration or rehabilitation of the plant was either uneconomic or not possible at the present time, and here the main factor intervened at once—namely, that of economics.

In considering such cases one usually started with a ceiling price for gas at consumer's meter, but in the costs given in the paper Mr. Edwards did not give the price per therm of his gas. That was probably because each case had to be treated on its merits since only certain items of cost were common to all, and such matters as distance of refinery from the unit and consequent high transport costs could put L.P. gas out of court.

Oil 'Fogging'

Assuming that it was an economic proposition, then there were certain points he would like Mr. Edwards to clarify. He had referred to the French practice of 'fogging' the gas/air mixture with benzole or gas oil and pointed out that arrangements were made for this to be done at Whitland. The 'fogging' with a relatively non-volatile substance such as gas oil was understandable, but he was not clear as to what part benzole was supposed to play, particularly in mains and their joints. With respect to meter diaphragms he thought they would have to await the results of work now in hand, but help might probably come from synthetic diaphragms or possibly from dressings of the silicone type.

The work done by the Wales Gas Board on appliance conversion would be very useful to others as a general guide, and what might be termed the 'two stage' conversion of cookers described in the paper was particularly useful. The cost for conversion—namely, £3,000 for 750 consumers, or £4 per consumer—was lower than he had anticipated, particularly in small units. Would Mr. Edwards say what was included in that cost? Also, how many of the meters which had previously run on coal gas had to be changed? Mr. Edwards referred towards the end of his paper to a matter they had discussed frequently—namely, a suitable long-term contract for the supply of L.P. gases. He was not aware that such a contract had yet been made in the gas industry. Until such a happening took place installations of L.P. gas were based on assumptions.

Mr. Edwards said that with regard to the overall costing of the scheme as a whole the most important feature common to all of them was the price at which they could buy the product at the refinery. With regard to 'fogging' their minds were quite open as to whether it would be necessary to continue 'fogging' with benzole or not. If it was in the vapour form it might not be necessary to keep the diaphragms pliable. Gas oil was also used to wash the air put through the plant. In some districts it might not be so important, but they wanted the air going into the system to be as clean as possible. With regard to the number of meter changes, he had given some statistics in the paper which gave an indication of how many meters were changed over from coal gas.

In answer to Dr. Marsden's question seeking details of how the figure of £4 per consumer for appliance conversion was arrived at, he gave the following figures:

	£	s.	d.
Changing and re-greasing main cocks ...		8	0
Re-lubricating taps		6	6
Conversion of cookers	1	12	6
Conversion of wash boilers		2	6
Conversion of other appliances		15	0
Travelling and lodging allowance for fitters, workshop costs, pressure survey, transport, and sundries		15	6
	£4	0	0

Mr. A. Pickard (Llanelly) said he wondered why it had been emphasised in more than one place that the station meter should be fixed on the outlet of the holder. There must be some specific reason. They were all interested in unaccounted-for gas and they were aware that some of it was due to minute leakages from gasholders. The fixing of the station meter on the outlet therefore seemed to defeat its object. Another matter of interest was the statement that there was a variation of from 0 to 12% in the content of the butane containers, and that although the method of indi-

(*Concluded on p. 111*)

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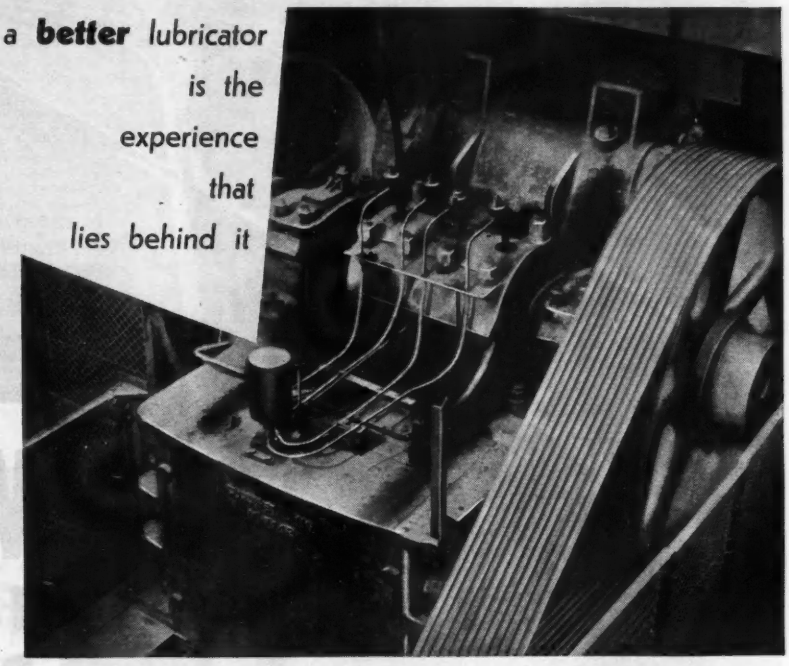

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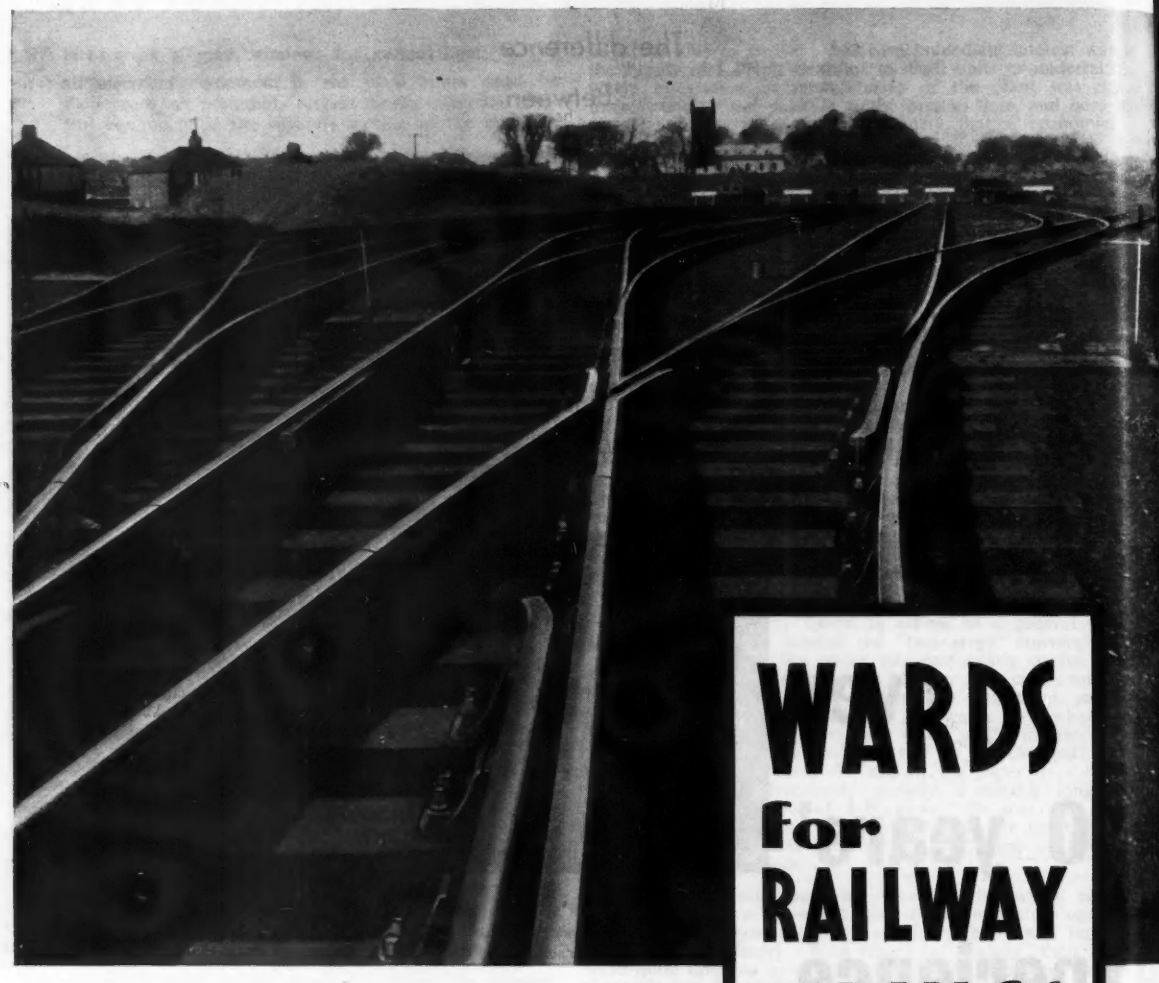

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The layout illustrated above shows a ladder of sidings at the Primrose Hill Unit of the National Coal Board, by whose courtesy the photograph is reproduced.

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cating the liquid level had not proved to be entirely accurate it had enabled the butane content of the supposedly empty containers returned to the oil refinery for refilling to be kept between nil and 300 lb. Earlier in the paper it was stated that the maximum amount of liquid filled into each container was regulated to 82% of the total capacity of the vessel. From calculations he had made from figures given in the paper he concluded that there was an average potential loss of 6%.

Those who attended the International Gas Congress at Brussels in June would agree with him that there were two main themes which proved of the greatest interest to the general body of gas engineers present—alternative methods of gas production, and fuel economy. On the first theme he did not think everybody agreed with the author's claim that whatever alternative methods were employed they would have to get back to coal. It was probably true of the large undertakings and of the more concentrated population centres, but it was doubtful whether it was true in the case of very small and isolated communities like many in Mid-Wales and possibly in the South Western area. With regard to fuel economy, their own Section had covered the subject very well at its Tenby meeting in the splendid paper by Mr. Gaskill, which had received notice in the Technical Press.

In his own Chairman's Address earlier this year he had referred to evidence submitted to the Ridley Committee. The report of that Committee had now been issued, and he did not think those who had had time to look at it should be pessimistic. It constituted a challenge to the industry to go on seeking—as the Wales Gas Board was seeking—to find alternative sources of fuel.

Check on Unaccounted-for Gas

Mr. Edwards said that with regard to the location of the station meter their endeavour was to keep a constant check on unaccounted-for gas, and they found from experience that taking meter readings regularly during the early hours, from 1 to 3 a.m., gave them the close check they required. Where they had put in a second meter they had found in one instance a difference between the two meters of between 20 and 25%. Regarding the quantity of butane left in the containers, the Board received credit for that amount because it purchased by weight. In future the receivers would have content indicators. He endorsed Mr. Pickard's remarks on alternative methods of gas production.

Mr. E. Ablett (Swansea) observed that governors were fitted to all cookers not already incorporating a governor, and to all wash boilers, and later in the paper he found that such governors were set at 2½ in. pressure, while the outlet pressure at the works was 5½ in. Inasmuch as he could find no specific reference to governors being fitted to fires or radiators or other apparatus he asked whether there was any special reason for having two governors—one on the cooker and one on the wash boiler—instead of one governor on the service itself. The paper went on to deal with the attention given to meter diaphragms; had similar attention been given to the diaphragms of governors and indeed to the rubber protection on lead rings for cast iron joints?

He congratulated Mr. Edwards on a paper which by virtue of its detailed and comprehensive character must be regarded as a text book on the subject. He had looked at the Ridley Report but had failed to find reference to this particular subject, but in a report issued by the petroleum industry he had found one brief paragraph which said that the consumption of liquefied petroleum gas in 1951 was 40,000 tons and that it was estimated that in 1956 the demand would be increased to 150,000 tons. That was a rate of increase which it seemed to him they in the gas industry must envy. There was obvious need for long term contracts at reasonable and economic prices. All they found in the Ridley Report was a recommendation that local authorities should be provided with incentives to install in their houses efficient coal and solid fuel appliances. He did not think such discrimination would turn them from their resolve to pursue their researches into the use of butane/air, and they would look forward to receiving in due course a further instalment of this valuable interim report that Mr. Edwards had given them.

Mr. Edwards said the problem of governors had not yet been finally resolved. They had concluded that governors were necessary for cookers and wash boilers, but they had obtained very satisfactory results in practice in other appliances. The possibility of having one governor to serve all the appliances in the house was being considered in connection with future installations, but they were not committed to the idea that governors were necessary in every installation. They had tried five different dressings for the leather diaphragms of governors and had not yet decided whether and if so what changes were necessary. The question of lead tipped rings for cast iron joints was common to all types of flexible joints in mains. They would prefer not to use natural rubber in the build up of the fabric; they would prefer to use a synthetic rubber.

Mr. H. J. Risby (Southport) recalled that over 50 years ago a Welshman named Jones was responsible for introducing a system of cracking oil and making oil gas, but he came up against other interests and had to discontinue it. He turned his attention to natural gas and went to America where he joined the Pacific Oil Gas Company. Subsequently he started the Jones oil gas plant in 1938. The late Mr. Geoffrey Gill was over in America and when he saw the oil gas plant he realised that it produced gas of characteristics equivalent to ordinary town gas. He thought it was such a marvellous system that he persuaded Mr. Jones to come back and start the Jones Oil Gas Company. He (Mr. Risby) became technical adviser to Mr. Jones. Some time later Mr. Jones and Mr. Gill presented a paper on the subject to the Institute of Fuel, and the system had been working all these years in America.

Mr. Edwards said they were aware that there were many plants operating on the system Mr. Risby had mentioned, but they were larger scale plants the installation of which would not be justified in the smaller works owing to capital costs and operating charges.

Mr. W. Clark Jackson (Coal Officer, Wales Gas Board) recalled that at the end of the 1914-18 war, when costs had greatly increased, there were great advances made in gas plant and production which enabled the industry to keep its head well above water and compete and extent its business. At the end of the 1939-45 war they were left to meet rising costs without any corresponding great improvements in gas making plants. He had felt for a long time that there were only two expedients that would enable them to meet present day conditions—one being integration and the other the process which had been the subject of Mr. Edwards' paper.

He asked whether any instructions had been given in regard to internal carcassing. In other instances, such as the use of Calor gas, all the work was in copper.

Mr. Edwards said they were looking round to see what could be done to meet the rising costs left by the last war. It was of vital importance to the gas industry, for they did not appear to be immediately equipped with technical advances equivalent to those they encountered after the 1914-18 war. With regard to internal carcassing their experience was that normal carcassing methods as applied to town gas would be suitable for this mixture; the point would receive critical examination.

Plant from France

Mr. Sykes (W. C. Holmes & Co., Ltd.) said that when his Company received the order for the Mallet plant for Whitland it ran into all sorts of difficulties and decided to get the whole plant, lock, stock, and barrel, from France. The problem of how to store the butane in larger containers involved questions of railway and road conveyance, which was quite a big problem. At present the Mallet plant worked with a prime mover and depended on electricity. That might not be desirable so they were going to arrange for a supply of electricity from something like a diesel driven generator. Another question was that of a holder, and at present they were looking into the question of running the plant without a holder.

The question of housing the plant had been gone into by the Board. The tanks themselves should be under some sort of cover, as at Whitland, so that the housing for the unit could be relatively small. So far as his Company was concerned it was felt that housing was really necessary.

Mr. Edwards said he endorsed Mr. Sykes's remarks, especially about the necessity for some alternative form of prime mover. On the question of whether the tanks should be under cover, he would prefer to reserve judgment; in most instances cover for the tanks was not necessary.

Mr. W. T. Hird (Distribution Engineer, Wales Gas Board), proposing a vote of thanks to Mr. Edwards, said he had referred to a number of varying diaphragm treatments and

(*Concluded on page 116*)

Parkinson's New Canteen and Social Centre

IN February, 1951, work commenced on a new canteen for the employees of the Parkinson Stove Co., Ltd., and its associate company, Monitor Engineering, Ltd. After the war, it became evident that the old canteen premises and equipment were no longer adequate for peacetime needs, and in the interests of sound industrial relations, the Company felt that any new canteen should include a centre to cater for the many social and recreational activities of the Parkinson and Monitor Social and Athletic Club.

It was decided that a new building should be erected on a site on the Iron Lane side of the factory, which was occupied before the war by the old water heater workshops and destroyed by enemy action on the night of April 9, 1941. Some work was started on the foundations in 1947, but it was not until February, 1951, that the revised plans and necessary building formalities were completed and work actually began.

The facade of the building is of red brick, and has a maximum area of window space on all four sides; it is set back from Iron Lane with a frontage of lawns, trees, and flowers. The area can be segregated by gates from the main factory when being used solely for social purposes.

The ground floor consists of kitchen, cafeteria, and dining room, and the kitchen is equipped with a battery of six 'Unita' cookers. There are special sections for the preparation of fish and vegetables, cold room, capacious stores, and a tea-making point for the factory trolley service. All walls and floors are tiled for ease of cleaning.

Conveniently adjacent to and in front of the kitchen is the main cafeteria—which contains a bar for use on social occasions by the Parkinson and Monitor Social and Athletic Club, who are holders of the licence. Adjoining is the dining room, where there is waitress-service, and where charges are consequently a little higher than in the self-service cafeteria. All employees have the use of either of these rooms.

On the ground floor are the new offices of the personnel department, having direct access to Iron Lane at one end, and the factory at the other. The two waiting rooms are equipped with comfortable chairs and an ample supply of periodicals, with provision for the display of posters of special interest.

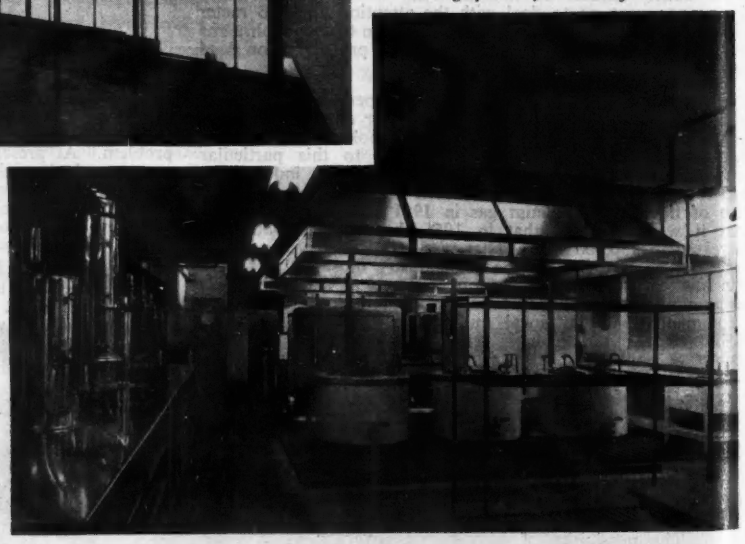
At the opposite end of the building, a wide staircase leads up to the landing with well equipped cloak-rooms and a toilet for visitors. Double doors open into the main hall which occupies practically the whole area of the building.

(*Continued on page 115*)

Above: *Battery of six Parkinson Unita cookers in the canteen kitchen, which is equipped with the most modern appliances.*

Left: *View of the kitchens as seen from the cafeteria. Floors throughout are in tiles and all table and counter tops are in heatproof plastic.*

Below: *General view of kitchen which has sections for preparation of fish and vegetables, cold room, stores, and tea-making point for trolley service.*



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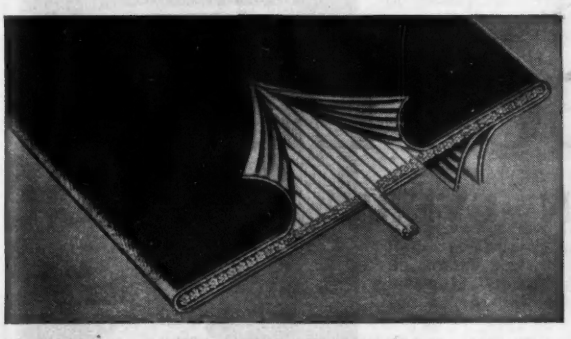

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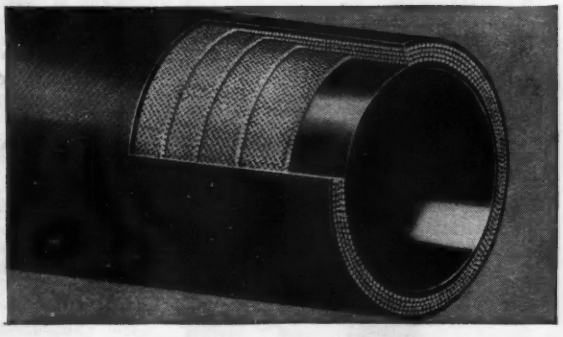

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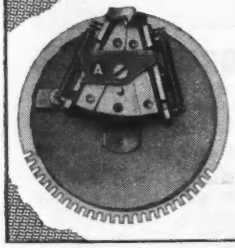


Fig. 1, on left, shows the back of the range-plate adjusted for optional coin. The swinging plate 'A' defies any attempt to insert a coin when one is already in the other slot.

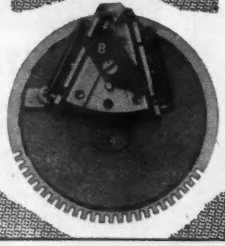


Fig 2, on left, shows the plate positioned to admit sixpences only. To make this adjustment, loosen screw 'B' and tighten it again with the plate in the new position.

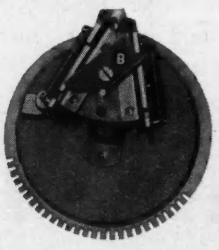


Fig. 3, on left, shows the plate positioned for shillings only. To make this adjustment, remove screw 'B', reverse the plate as shown and replace the screw.

SAM[L.] CUTLER & SONS L[TD.]

70 Victoria Street, WESTMINSTER, S.W.1 - Telephone : Tate Gallery 9592. Telegrams : Retortus, Sowest, London.
Providence Iron Works, MILLWALL, E.14 - - Telephone : Abbey 3121. Telegrams : Cutler, Millwall, London.

PARKINSON'S NEW CANTEEN—Continued from page 112.

The stage, at the far end of the hall, is equipped with the most modern form of lighting and sound apparatus and a cyclorama for special effects. On either side are dressing rooms, and there is a space at the back of the stage for housing scenery and other properties.

The hall has two full-sized billiard tables and dart boards, and special lighting is installed for a boxing ring and table tennis as required. There is ample room for dancing or, alternatively, for seating an audience at plays and concerts. The windows are curtained to allow for mid-day film shows.

The colour scheme throughout the building is based on Dutch pink and Nile green—the latter being used for ceilings in each room. Floors throughout are of special tiles in green, maroon and some black. These make a delightful warm colour combination. All the table and counter tops are in heatproof plastic in the same pink and green.

In the cafeteria and dining room, specially designed abstract murals have been painted giving a warm and inviting effect and completely eliminating the 'institution' impression of less modern canteens. This was not easy to achieve as the main purpose of the project is, after all, functional; but Parkinsons are proud of the amenities which they have provided and are confident that the fullest possible use and enjoyment will be derived from them.

TRADE NEWS

R. & A. Main, Ltd.

WE had the opportunity recently of inspecting a new cooker produced by R. & A. Main, Ltd. It is the No. 20 'Century' cooker in cream enamel finish, constructed generally of stamped steel.

The hotplate is in cream enamel, 20¼ in. wide by 19¼ in. deep, fitted with four boiling burners, and one grill burner, each having a rating of 12,000 B.Th.U./hr. All burners are finished in black vitreous enamel, the front and back burners being in pairs as one unit which are interchangeable. Heat-resisting

R. & A. Main's new No. 20 'Century' cooker.

grill frets are fitted with enamelled cover. Cast iron removable and interchangeable pot supports are finished in heat-resisting black enamel. All burners have independent safety control taps with fixed injectors and black plastic handles with metal trim, oven tap having distinguishable red trim. The cooker has an aluminium pressure governor and front-reading oven thermostat; loose spillage tray and black enamel grill pan with close mesh wire grid.

Inside sizes of the oven are 17 in. wide by 15½ in. deep by 14 in. high, fitted with single burner at rear, having a rating of 10,500 B.Th.U./hr. There is a flash ignition tube at the front for simplicity in lighting the burner.

Oven interior linings are finished in vitreous enamel with sides embossed to act as runners for two plated grid shelves. A tinned meat pan and stoved black cake tray are also provided. There is a drop down door with black plastic handle with plated trim. The flue outlet is at the rear of the hotplate in front of splashplate. The cooker is mounted on a plinth base having removable front panel and fitted with levelling screws for adjustment.

Lang-London

A NEW portable unit, styled the 'Langfilcon,' is designed for the speedy transference of liquids from one container to another. British made throughout, it has been primarily constructed to operate in the production unit itself—*i.e.*, mixing machine, process tank, or storage vessel. It need not be permanently installed, and does not therefore require valuable factory floor space.

The 'Langfilcon' automatically incorporates any sediment, and will work just as efficiently in large or small containers. The contents of one vessel can be transferred into another container, or into a batch of containers simultaneously if the multi-discharge head is used, quickly and cleanly, with a minimum of aeration. It operates continually. Flow begins immediately on starting up, but is controlled by a simple cock on the outlet branch. If it is necessary temporarily to discontinue filling there is no need to stop the unit, as the flow of liquor is independently controlled by the operator.

Effective cleaning can be performed by working the unit for a minute or two in water or suitable solvent, making it possible for the 'Langfilcon' to be switched from colour to colour, or from one product to another, with comparatively little delay. It is available in a wide range of sizes for manual or power operation, all of which can if necessary be suitably constructed to suit the particular needs of individual customers.—*Lang-London-Limited, 280, Euston Road, N.W.1.*

General Gas Appliances

THE 'Victor,' made by General Gas Appliances, Ltd., is a luxury cooker offered at low price. Specially designed for the medium income group it should prove outstandingly popular with the smaller households. The 'Victor' combines gleaming good looks and modern labour-saving devices; it is the economic answer to the salesman's problem.

Special features of the 'Victor' cooker are the following:—

(1) All white high grade enamel finish throughout.
(2) Four boiling burners and grill.
(3) Removable hot plate.
(4) Interchangeable pan supports.
(5) Large oven, 16 in. high, 15½ in. wide, 14 in. deep.
(6) Self-latching door.
(7) Thermostat for oven.
(8) Removable plate rack.
(9) Press-in safety taps, removable.
(10) Pedestal base, with removable front.

The 'Victor' will be on sale at all gas showrooms in the next few weeks. Following on the 'Junior General' gas cooker for the small flat and the 'Raymond,' luxury cooker, the 'Victor' is designed to fill a gap and to find a warm welcome in the modest home.—*General Gas Appliances, Ltd., Audenshaw, Manchester.*

TRADE NEWS — Continued from page 115

Nu-Swift Ltd.

NEGOTIATIONS over the last five years have resulted in the acceptance and approval in the United States of a pressure-operated fire extinguisher manufactured by Nu-Swift, Ltd. This is the first foreign-made fire extinguisher ever approved for use in the United States.

The approval of this extinguisher on behalf of the Associated Factory Mutual Fire Insurance Companies opens up a considerable dollar export field for Nu-Swift pressure-operated extinguishers.

Quasi-Arc

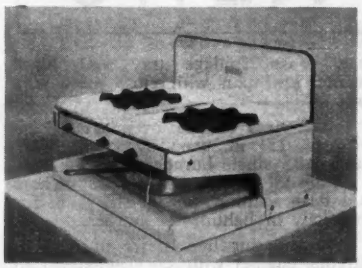
A TECHNICAL circular issued by the Quasi-Arc Company, Ltd., describes their low hydrogen 35 electrode which has been designed to provide an ultimate tensile strength of at least 35 tons/sq. in. in the weld metal. These electrodes are classified according to B.S.1719:1951 with the coding E.616 (corresponding to the American Welding Society coding E.7016). The hydrogen content of the weld metal deposited by the various sizes of low hydrogen 35 is 0.5 ccs. to 1.5 ccs. per 100 grammes of deposited metal, thus being well below the requirements of the American Welding Society specification which permits up to 10 ccs. per 100 grammes of deposited metal.

Such electrodes are used for welding medium high tensile, carbon and alloy steels, and also for commercial quality steels having higher carbon and sulphur contents than mild steel of welding quality. They are also widely used for welding highly restrained joints and heavy sections of mild steel. They are made in sizes 12 swg. to $\frac{5}{16}$ in. diameter.

The Quasi-Arc Co., Ltd., has also produced a 12-page illustrated pocket size booklet, reference IB.3, giving instructions for the installation, operation, and maintenance of the Quasi-Arc A.C. portable arc welding plant, Type ACP. 300. It includes circuit and connection diagrams and recommendations for installation and inspection. Copies of both these publications can be obtained on application to the Quasi-Arc Co., Ltd., Bilston, Staffordshire.

Sidney Flavel

OUR illustration shows a new development on the 'Imp' cooker marketed by Sidney Flavel & Co., Ltd., which is proving of increased popularity. Notable change is the design of the hotplate, which embodies the cantilever



principle. This allows efficient and easy cleaning and it undoubtedly merits particular attention. The clean lines of this newly designed appliance are apparent from our illustration.—*Sidney Flavel & Co., Ltd., Leamington Spa.*

G.E.C.

THE comprehensiveness of the G.E.C. range of lighting batteries has been extended by the introduction of the heavy duty, 1.5 V, BA6121 gaslighter cell. The cell is 2 in. in diameter and $4\frac{15}{16}$ in. high, and fits any standard gaslighter. Its weight is $13\frac{1}{2}$ oz., and the list price is 2s. 6d. *General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.*

Air Control Installations

A NEW leaflet by Air Control Installations, Ltd., describes the Cycoil oil bath air cleaner which removes the fine dust that causes damage to engines and compressors. In passing through the cleaner the dust laden air picks up an unusually large quantity of oil, with which it is thoroughly mixed in a vortex. Most of the oil picked up is then thrown out by centrifugal action, carrying with it over 90% of the total dust content of the air. The remaining dust, plus a small amount of oil, passes to a filter cell, where it also is removed. The net result is practically 100% efficiency in dust removal, positive oil circulation which ensures continued self-cleaning action, and large dust-holding capacity without any danger of oil pull-over. Silencing is accomplished by breaking up the sound waves as they pass through the oil-coated vanes, by expansion and contraction of the air stream and by the changes in direction of air flow. The Cycoil is made in two types and nine convenient sizes, suitable for a wide range of duties.—*Air Control Installations, Ltd., Ruislip, Middlesex.*

Trade Publications

CROSSLEY CHRONICLES.—A periodical review of matters concerning Crossley marine, locomotive, and land type oil engines, also gas engines and gas producing plant, etc., published by Crossley Brothers, Ltd., Manchester 11.

* * *

THE ELLIOTT JOURNAL.—A half-yearly review of developments in engineering and physical science with particular reference to the work of Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.

* * *

THE STANTONIAN.—House journal of the Stanton Ironworks Co., Ltd., Nottingham, containing surveys of the company's activities and news of staff social and sporting events.

USE OF LIQUIFIED PETROLEUM GASES — Concluded from page 111

dressings. After eight months working nothing had given any trouble; it would be almost helpful if something had given a little trouble. The general picture had been most encouraging and the diaphragms had given no trouble whatever. None of the old meters had given trouble. It was interesting to look at reports from some of the consumers. A large tea boiler in one factory was reported as 'quite satisfactory,' and a fish fryer reported that he was 'absolutely satisfied.'

So far as governors were concerned it seemed better to fit them to the burners rather than to the whole service. Certain radiators and burners had become noisy and they had fitted governors to deal with the noise. They now had 11 different gas cookers specially designed for butane-air, three gas fires, and three portable heaters. There was a wide range of water heaters, but only by a few manufacturers at the moment. A full range was now available with one exception—there was still no multipoint water heater available for butane/air. The sooner the manufacturers tackled that problem the happier they would be.

Mr. T. Mervyn Jones (Chairman, Wales Gas Board), seconding the vote of thanks, expressed regret at the absence through illness of Sir William Jones, who attached great significance to this particular subject in his capacity as Chairman of the Government enquiry regarding the depopulation of rural areas in Wales. In the small Whitland undertaking they were achieving increases of from 19 to 30% in gas consumption. There was much significance in one recommendation in the Ridley Report—that the price of gas should be directly and closely related to the costs of providing it at the point of supply. With the typical generosity that had marked all his activities Mr. Edwards had said this work was largely the result of co-operative effort. The Wales Gas Board unanimously and enthusiastically on the advice of Mr. Edwards decided to embark on this experiment. The totality of the cost had been borne by the Wales Gas Board without any formal assistance from any other gas board or from the gas industry in general. They were quite content to make the results available to every other board. In addition to leadership there was the question of expert advice, and he paid tribute to the excellent work of Mr. Hird and Mr. S. L. Wright, who were still with the board, and of Mr. W. R. Branson, who had now transferred his activities to another area. 'We are extremely proud of our chief officers,' continued Mr. Mervyn Jones, 'and never more so than when we have a report like this before us.'

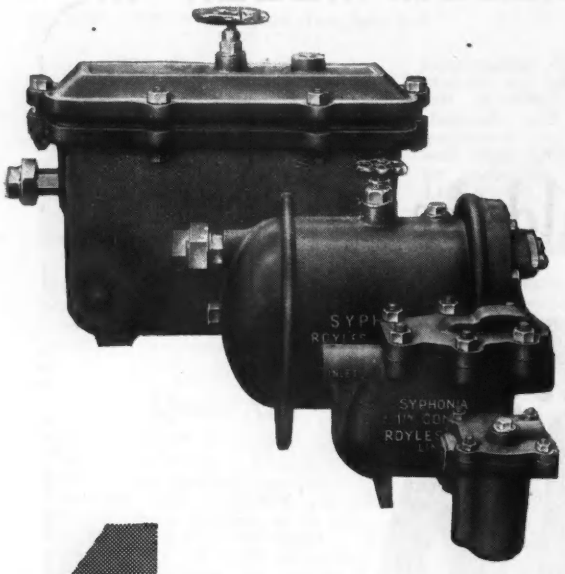
Mr. Edwards, briefly acknowledging the vote of thanks, said the Whitland experiment had been a co-operative effort from the chief officers down to the men who handled the tools.

production could be better

Let's face it. Peak Iron-and-Steel production is essential to us as a nation; no one can be under any illusion about that. To keep at peak production, we must have more (lots more) iron and steel scrap. Conjure-up all you can, and see a scrap merchant about it. That will do the trick.

IRON AND STEEL SCRAP IS VITAL

THIS SPACE GIVEN BY THE STANTON IRONWORKS COMPANY LIMITED TO ASSIST THE NATIONAL SCRAP RECOVERY CAMPAIGN



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STEAM TRAPS
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SYPHONIA
for maximum steam economy

SYPHONIA RAPIDE
for quick discharge, large duties

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for continuous discharge
medium capacity

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for general purposes, small duties

Steam economy and reduced maintenance are obtained only when a trap is of the right type and correctly sized. We are always pleased to advise Clients from experience covering 50 years.

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COMPRESSORS & EXHAUSTERS FOR AIR AND GAS.

See our Advertisement Next Week.

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CASES FOR BINDING

Quarterly Volumes of the "Gas Journal."

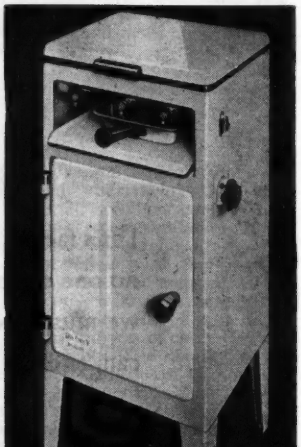
5/- each, post free

Walter King, Ltd., 11, Bolt Court, Fleet Street, London, E.C.4.

CRANE
LTD

For small Kitchens and Flats...

The
Dainty
MINOR



This efficient little cooker of large capacity is made especially for small kitchens and flats.

Its cast iron construction ensures durability and low maintenance cost.

For hire purchase or for simple hire. The 'Dainty' Minor is ideal.

Approved and adopted by leading gas boards.

Leaflet fully describing this efficient, attractive and economical cooker will gladly be sent.

R. RUSSELL & SONS LTD., DERBY

Agents for Scotland and Northern Ireland:

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STUDENTS - - - - STUDENTS

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"A MANUAL OF GAS FITTING"

by R. N. Le FEVRE, M.Inst.Gas E., A.M.I.Mech.E.
Training and Education Officer, North Thames Gas Board

The Theory and Practice of Gas Installation Work and the Servicing of Gas Appliances and Equipment

THE GAS INDUSTRY'S RECORD BREAKER

PRICE 30/-

WALTER KING, LTD., 11, BOLT COURT, FLEET STREET, E.C.4

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PUBLISHERS' NOTICE

The "Gas Journal" is published every Wednesday, price 1/3d.; by post 1/5d.

Subscription Rates: Home and Empire :- 52/- per annum; Foreign :- 60/- per annum. (Both payable in advance.) A copy of the "Gas Journal" Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 1/9 per line (approx. 7 words) - minimum charge 10/6. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10" deep x 7" wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

MIDLANDS OFFICE: 10, Union Street, Birmingham.

NORTHERN MANAGER: W. Q. Foster, 33, St. Helens Road, Harrogate. 'Phone: Harrogate 84291.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.
Telephone: CENtral 2236-7. Telegrams: Gasking, Fleet, London.

PUBLICATIONS

GAS ACCOUNT CALCULATORS

SUPPLIED either by Price per Therm or Thousand, for any specified Calorific Value, in book form, office charts, or pocket charts for Meter Inspectors, printed in clear type. Write for particulars to F. H. WAKELIN, LTD., Calculator Specialists, 354, WHEELER STREET, BIRMINGHAM.

'Phone: Northern 0989. 'Grams: Reckoners, B'ham.

THE BRITISH GAS PURIFYING MATERIALS CO., LTD.

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SMALL single truckloads and larger quantities of good ROUGH BREEZE from any gasworks, large or small, in the United Kingdom required by merchants paying own railway tolls. Cash price and particulars to No. 9378, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

MOISTURE TESTING for coal, coke and ash and many chemicals. Modern method is 'SPEEDY' MOISTURE TESTER giving accurate percentage water in 2/3 minutes. Already in use extensively in Gas Industry. Needs no electricity. Portable, simple for use by unskilled labour. Write for illustrated brochure, or order direct, £24 10s. 0d. complete—Thos. Ashworth & Co., Ltd. (Dept. G.J.), Basket Street, Burnley, Lancs.

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SPECIALLY ACTIVATED OXIDE OF IRON

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Highest prices paid for Spent Oxide.

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Pressure-operated by sealed CO_2 Charges

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THE COOKER CLEANER

"KLEENOFF"

FIBRE BRUSHES
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(NEW "KLEENOFF" PRODUCT)

* *For resale to the public, and in bulk for Works use*

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NEW AND BRIGHT COLOURS
Such as
STONE - LIGHT and DARK GREY
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'HUMIDINE' will outlast any other RUST prevention paint and costs far less

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'Phones: SKIPTON 548/9,

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APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

THE NORTH WESTERN GAS BOARD, BLACKPOOL, require three FIRST CLASS GAS-FITTERS.

Preference will be given to candidates who possess the City and Guilds' full Technological Certificate in "Gasfitting" or with equivalent qualifications and experience. J.I.C., Schedule rates of pay.

Applications in writing, stating age, qualifications and full details of experience and training should be addressed to The Personnel Officer, North Western Gas Board, Fylde Group, Princess Street, Blackpool, ten days from the publication of this advertisement.

SCOTTISH GAS BOARD

DUNDEE GROUP—DUNDEE DISTRICT

GENERAL WORKS FOREMAN

APPLICATIONS are invited from suitably qualified persons for the position of GENERAL WORKS FOREMAN with the Dundee Undertaking of the Scottish Gas Board.

The appointment is governed by the Terms and Conditions agreed by the National Joint Standing Committee of the National Joint Industrial Council and the National Joint Council for Gas Staffs.

The salary will be Grade X, Provincial 'A' of the National Salary Scales for Intermediate Grades, *i.e.*, £515-£560 per annum with placing within the Grade according to qualifications and experience.

Applicants must be Engineers to trade and should have knowledge and experience of the Operation, Maintenance and Repair of Gas Works Plant, the handling of men and be able to co-ordinate the work of various departments each with their own Foreman.

Applications giving details of experience, positions held and the names of two referees should reach the undersigned within seven days of the publication of this advertisement.

W. S. JOHNSTON,
Group Manager.

Gas Works,
50, East Dock Street,
Dundee.

PLANT FOR SALE & WANTED

COMPLETE GAS PRODUCER PLANT by International Furnace Equipment. Gasifies 100 tons bituminous fuel weekly. Storage bunker fed by belt bucket elevator. Adjustable feeding device. Electrostatic precipitator by Whessoe. All necessary control equipment, etc. Little used. Richards Tiles Limited, Tunstall, Stoke-on-Trent.

NORTH WESTERN GAS BOARD

BOLTON GROUP

FOR SALE—

'SENTINEL' LOCOMOTIVE

WEIGHT 24 tons, Wheelbase 4 ft.-9 in., Tractive effort 1,300 lbs. Purchased new in 1947—in good condition. Full specification and Insurance Reports may be seen by application to:—Thos. Haworth, Esq., Group General Manager, North Western Gas Board, Bolton Group, Hotel Street, Bolton, Lancs.

WANTED:—REGULAR SCRAP GAS METERS AND PARTS. Best prices paid. Offers to:—Mitcham Smelters Ltd., Red House Road, Croydon, Surrey. *Tel.*: THOrnton Heath 6101 (Private Branch Exchange).

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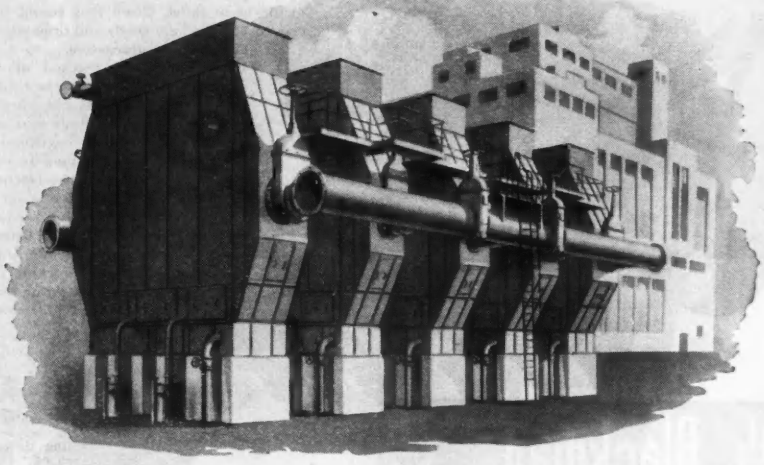

COLONNADE CONDENSERS

Recent tendencies towards centralization of gas production into large single gas streams favour gas condensers having high water velocities in vertical open ended water tubes and high gas velocities across the tubes.

An arrangement of this design of condenser is shown above.

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BECAUSE MEN CANNOT WORK at full stretch under the op pressive conditions existing in industrial "hot spots" without some means of relief. Often they resort to "taking a breather". Be "breathers" are costly and time-wasting.

Consider the alternative.

The "Tornado" method of man-cooling definitely en courages production all the time. Man-cooling fans deliver for as long as is necessary, a brisk, cooling air current which relieves excessive body heat and improves breathing con ditions. Designed particularly for use in the "heavy" trades they combine an easy portability with robust construction — two essential characteristics.

If your concern is for workers in iron and steel works, foundries, boiler houses, gas retort houses, glass works or "lighter" industries where effi iency is bound up with the maintenance of com fortable working conditions then you should see Publication No. 9/7.

A copy is waiting for you.

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Screen Wall for West Midlands Gas Board

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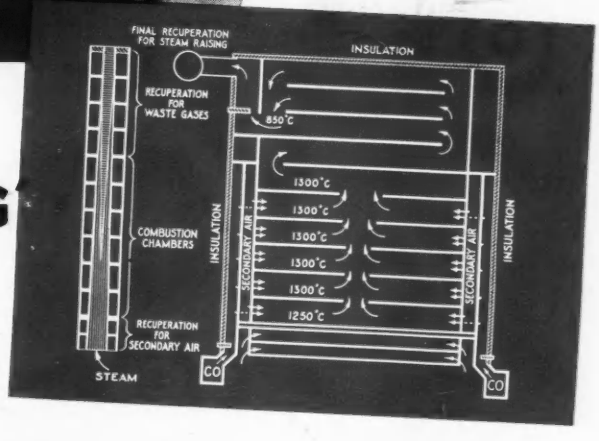
GAS MAINS RAILWAY SIDINGS ROADS ETC.

ROBERT M. DOUGLAS (CONTRACTORS) LTD., 395 GEORGE ROAD, BIRMINGHAM, 23 and BRIDGE ROAD, WAUNARYLWYDD, SWANSEA

Printed by STRAKER BROTHERS LTD., E.C.2, for WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C.4. Wednesday, October 8, 1952



'BALANCED HEATING saves fuel

"Balanced Heating", a feature of the Glover-West continuous vertical system of carbonization, reduces fuel consumption to a level hitherto unobtainable. In the "Balanced Heated" setting, producer gas enters the combustion chambers from *both* sides and retorts are evenly heated by *primary* combustion. Combustion proceeds towards the centre of the setting, heat transmitted to the outer walls being recovered in the producer gas and air uptakes and returned to the system. Control of temperature in individual combustion chambers gives greater flexibility—an important factor today when many different coals are handled by one plant.

★*Illustration shows a "Balanced Heated" setting under construction*

West's Gas IMPROVEMENT CO. LTD.

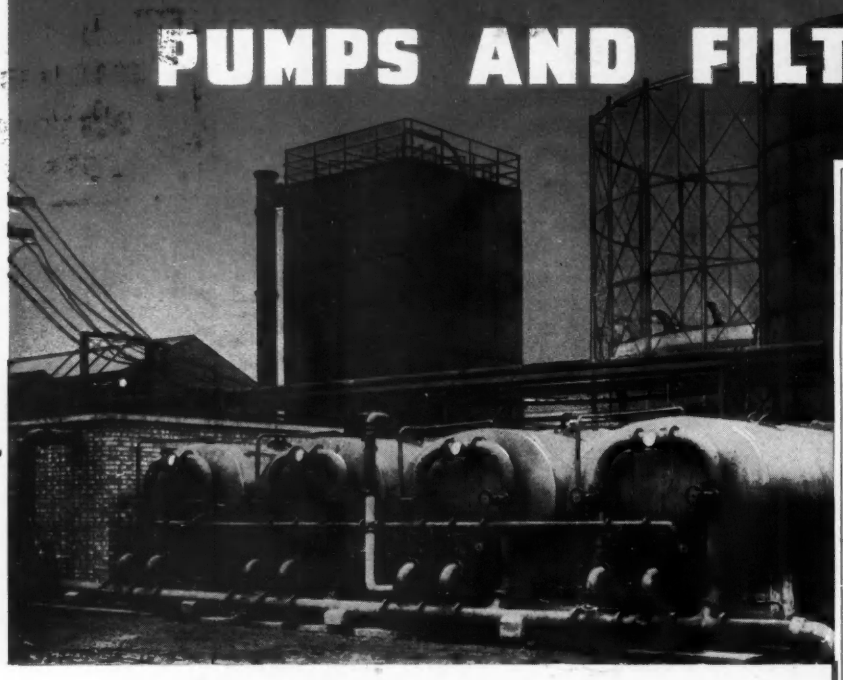
ALBION IRONWORKS · MILES PLATTING · MANCHESTER 10

Telephone: COLlyhurst 2961. Telegrams: Stoker, Manchester.

London Office: Columbia House, Aldwych, W.C.2. Phone: HOLborn 4108-9 Grams: Wesgasco, Estrand.

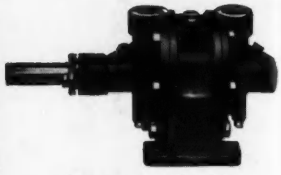
Pulsometer

PUMPS AND FILTERS

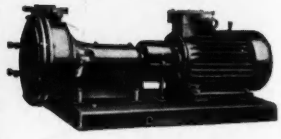


Filtration Plant in Gasworks

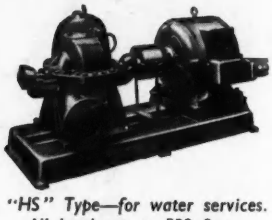
The illustrations show centrifugal pumps for light and heavy oil and liquor duties, stoneware and special metal pumps for handling acids and alkalis, pumps for circulating and washer duties, for clean water and fire services and for liquids containing abrasives.



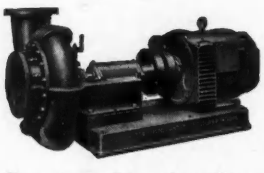
Rotary pump for Oil transfer duties.



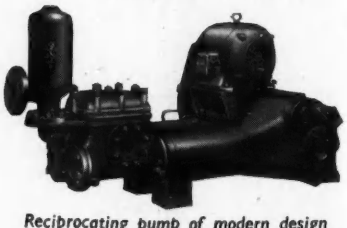
Stoneware pump for Corrosive and chemicals.



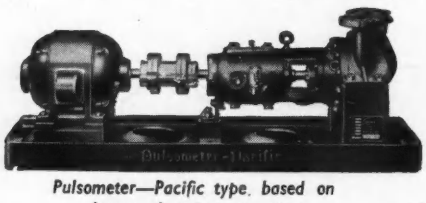
"HS" Type—for water services. All heads up to 500 feet.



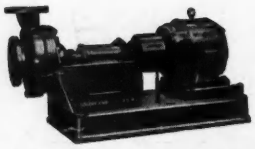
Slurry pump for coal washing and abrasive liquids.



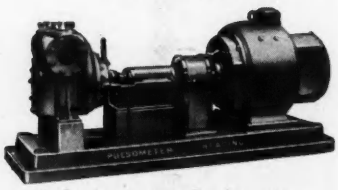
Reciprocating pump of modern design for Gas Works.



Pulsometer—Pacific type, based on latest American practice.



"JA" & "JB" types for high temperature water circulation.



Self priming centrifugal pumps.

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